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*President*  
P. HUTCHINSON

TECH-96-791  
10/18/96

TO: AIAM Technical Committee

FROM: Gregory J. Dana  
Vice President and Technical Director

RE: **GLOBAL WARMING - GCC - Minutes of September 19,  
1996 STAC Meeting - Report on September 24-25, 1996  
IPCC Workshop**

Enclosed is a copy of the minutes of the September 19, 1996 meeting of the Science and Technology Assessment Committee of the GCC. Also included is a report on the September 24-25, 1996 International Panel on Climate Change (IPCC) Workshop held in London.

GJD:lfz



**Minutes of GCC Science and Technology  
Assessment Committee  
September 19, 1996**

**Call to Order:**

Co-Chair Lenny Bernstein called the regularly scheduled meeting of the Global Climate Coalition, Science and Technology Assessment Committee to order at 11:00 a.m. An agenda was mailed to all STAC members and is attached. The Chemical Manufacturers Association, 1300 Wilson Boulevard, Arlington VA hosted the meeting.

**Approval of Minutes:**

The minutes of the August 1, 1996 STAC meeting were approved without discussion.

**Exxon Assessment Presentation:**

Dennis Devlin and Barry Friedlander of the Exxon Biomedical Sciences Inc. were present to discuss their summary of published literature on human health impacts of global climate change. Dennis Devlin made the presentation. A copy of his visuals are attached. The Exxon report that formed the basis of Dennis Devlin's presentation has been previously distributed to STAC.

A key point of the Exxon presentation and report is that most researchers publishing in the area of climate change health impacts are proponents of the view that climate change could cause serious health impacts. For example, few dissenting views were expressed at the NAS sponsored conference on this topic in 9/95, and calls for a more balanced discussion of this issue made at that meeting by Dr. Grubler were not reflected in the meeting proceedings. Dr. Grubler is Director, Division of Vector Borne Disease at the Center for Disease Control.

Dennis distributed two additional documents. The first, a summary of the Presidential Decision Directive on Emerging Infectious Disease, identifies climate change as one of the factors contributing to the threat of emerging diseases. The second, an editorial from the July 27, 1996 issue of the British Medical Journal, showed that this prominent medical journal viewed climate change impacts on health as a major concern.

Dennis also circulated a book title of Climate Change and Human Health by A. J. McMichael, et. al. published by the World Health Organization, 1996. This text is written by many of the same people who wrote the IPCC SAR chapter summarizing the "state of the knowledge" of climate change health concerns, so views expressed are essentially identical. It includes, by in large, only perspectives of scientists with the view that climate change presents a serious health risk.

The attending Exxon scientists advocated critical evaluation of models and ongoing studies to put climate change health hazards in perspective. They promoted encouragement of scientific work in this area by scientists that would present a more balanced view. During and following the presentation, STAC members discussed ways of encouraging a more

balanced scientific evaluation of this concern. STAC members expressed their positive impression of the quality of the literature review and assessment made by Exxon on this issue. They offered suggestions on improvement and further use of the presentation.

#### **Discussion of Health Impact Issue:**

STAC next discussed how GCC could increase involvement in this issue. Lenny Bernstein discussed two groups that perhaps could help GCC, the Institute for Evaluating Health Risks (IEHR) based in Washington, D.C. and the American Council on Science and Health (ACSH) based in New York City. Lenny distributed information provided by John Moore of IEHR.

Lenny reported that Dr. Elizabeth Whelan of ACSH is considering doing an independent assessment on the climate change and health issue. Lenny noted that many GCC member companies support ACSH and urged those that did to ask their companies to write to Ms. Whelan asking for such an assessment.

Barry Friedlander of Exxon noted, that due to the distribution of ACSH reports, an ACSH assessment would reach a non-science audience. Thus, he suggested GCC might want to encourage participation of good science research institutes such as the Tropical Medicine Department at Tulane or LSU.

Lenny asked STAC members to keep him informed of their efforts to involve medical staff in their companies in this issue.

#### **GCC Report:**

No GCC Report was presented.

#### **IPCC Plenary:**

Bronson Gardner reported that COP-2 had released guidelines for national communication. The guidelines would allow better comparisons between countries and a better understanding of a country's progress in achieving its goals over time. These COP-2 guidelines closely followed GCC and U.S. recommendations for developed countries but not for developing countries.

Bronson reported that at the IPCC plenary at Mexico City, Bob Watson was elected as new chairman. Watson is currently chair of IPCC WGII and an employee of the World Bank. He will replace Burt Bolin at the next IPCC plenary in September 1997 (approximately). Bob Watson will be resigning his chairmanship of WGII. Concern was expressed that Watson would likely not be as impartial as Bolin.

Bronson said a draft report on what had transpired at the 1995 Madrid and Rome meetings of the IPCC WGI and IPCC plenary was presented for plenary approval at Mexico City. GCC strongly objected. It was not approved at the plenary, and consequently it was released as "views of the chair."

#### **IPCC Technical Reports:**

Three draft technical reports were reviewed by IPCC in Mexico. Attendees viewed report 1 on Policies and Measures as consistent with the rules of procedure. It was sent on to the IPCC Bureau with few comments. Reports 2 and 3 provoked strong arguments because they were not based on the Science Assessment Report. The meaning of the rules requiring technical reports to be based on the SAR were discussed, and GCC was 100% successful in obtaining a revised more restrictive revision of the rule for technical reports. The rule emphasizes that technical reports must be based on the SAR and or models used to develop the SAR.

#### **IPCC Modeling Workshop:**

Bronson will be unable to attend the IPCC Model Workshop next week in London. At the August STAC meeting, Chuck Hakkarinen told STAC that he was planning to attend.

#### **Future Meeting Schedule:**

The next STAC meeting was scheduled as a conference call at 2 P.M. EDT on October 17, 1996. It should last approximately 1 hour. Lenny will contact STAC members concerning this call. The main agenda item will be a follow-up to the Exxon health affects report. Lenny will also discuss any further contact with IEHR & ACSH.

The November meeting is yet to be scheduled. The December meeting will likely be skipped and the January meeting is likely to be moved to early January.

#### **Other Business:**

STAC members discussed climate change science issues of greatest priority to industry.

Jerrel Smith noted that Bronson Gardner considered "base line shifts," or the difference between the extent of changes that would occur with and without climate changes, a major concern needing further evaluation. Lenny thought that looking at all climate change base line shifts was too broad of an issue. He suggested concentrating on a narrower subset or issues, such as regional climate change or public health. At a meeting of industry people he recently attended, Jerrel said no one thought SO<sub>2</sub>, the current focus of ACACIA, was a significant issue. Eric Kuhn mentioned that a recent informal meeting of utility industry people had focused on the regional impact issue.

The discussion did not reach a conclusion prioritizing these issues.

Before adjourning, STAC agreed to the following statement:

"STAC is concerned with the lack of balance in the peer reviewed literature on the health effects of climate change. STAC believes a strong need exists to encourage balanced quality studies in this area."

Submitted by:

Eric Reiner

3M representing CMA

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**Attachments:**

- 1) GCC Science & Technology Assessment Committee Agenda
- 2) List of attendees
- 3) D. J. Devlin overhead presentation
- 4) Summary of Emerging Infectious Disease Presidential Decision Directive report
- 5) British Medical Journal editorial on climate change
- 6) Letter from John A. Moore - Institute for Evaluating Health Risks
- 7) IPCC Activities for 1996-1997
- 8) Side by Side comparison of comments submitted by the GCC and the U.S. government on National Communications and the documents produced at COP-2.
- 9) Revised Discussion Paper on Technology Assessment by Bob Watson
- 10) Letter from the U.S. House of Representatives Committee on Science
- 11) Paper on Uncertainties in Climate Modeling: Solar Variability and Other Factors
- 12) Statement Regarding 1995 WGI meeting in Madrid.
- 13) Bronson Gardner's summary of 1996 Mexico City IPCC meetings

Note: sent only attachments 1,2, 12, and 13 to those who attended.

9/19/96

**GCC SCIENCE AND TECHNOLOGY ASSESSMENT COMMITTEE**

September 3, 1996

Members of GCC-STAC

Agenda and Papers for September 19 Meeting

The next GCC-STAC meeting will be held at 11:00 a.m. on Thursday, September 19, at the Chemical Manufacturers Association, 1300 Wilson Boulevard, Arlington, VA. The two main topics of discussion at the meeting will be:

- 1) a report by Exxon on their assessment of the public health implications of projected climate change (a copy of this report is attached), and
- 2) a report by Bronson Gardner on the IPCC Plenary meeting held in Mexico City, Sept. 11 - 13.

**DRAFT AGENDA**

1. Approval of the Minutes
2. Exxon Assessment of Public Health Implications of Climate Change  
Devlin/Friedlander
3. GCC Report  
Shlaes/Holdsworth
4. IPCC Technical Papers - GCC Response  
Bernstein/Gardner
5. Results of IPCC Plenary  
Gardner
6. IPCC Modeling Workshop - London  
Gardner
7. Future Meeting Schedule  
Bernstein
8. Any Other Business
9. Adjourn



L. S. Bernstein





9/16/96

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# **PURPORTED IMPACT OF CLIMATE CHANGE ON HUMAN HEALTH**

**September 19, 1996**

**D. J. Devlin - Exxon Biomedical Sciences, Inc.**

AIAM-051504

Attachment 3

7/17/76

# **PRESENTATION OUTLINE**

- **Summarize Key Literature Re Purported Effects of Climate Change on Human Health**
- **Review/Assess “Advocates’ Hypothesis”: “Greenhouse Gases” Lead to Health Impacts ... Balanced Scientific Position Not Evident**
- **Describe Key Knowledge Gaps**
- **Offer Conclusions/Recommendations for Follow-up**

# **INTRODUCTION**

- **International Attention Focused on Relationships Among Greenhouse Gases, Climate Change, Ecological Stress and Human Health**
  - ▶ **National Academy of Sciences (NAS) Sponsored Conference on Potential Impacts of Global Climate Change on Health (9/95)**
  - ▶ **Intergovernmental Panel on Climate Change (IPCC) Report Reviews "State of Knowledge" . . . Raises Significant Health Concern**
  - ▶ **Medical Journals ... Relate Climate Change to Incidence of Disease**
  - ▶ **Popular Press Raising Issue of "Megastorms" ... "Global Fever" ... "Emerging Infectious Disease"**

# **NAS CONFERENCE**

- **Conference Requested by VP Gore, to:**
  - ▶ **Encourage Experts to Address Potential Effects of Climate Change on Disease, Heat Stress, Food/Water Supplies, Air Pollution**
  - ▶ **Develop Response Strategies**
- **Organizers Assumed *a Priori*: Global Climate Change is Occurring ... Will Impact Health ... Only Degree Is Unknown**
- **Many Disciplines Involved. . . Few "Experts" . . . Many "Advocates" With a Consistent Message**

# **THE HYPOTHESIS**

- 1) Greenhouse Gases Increase Due Primarily to Fossil Fuel Use**
- 2) Accumulation Leads to Increase in the Average Global Temperature . . . 1 - 4°C in the Next 100 Years**
- 3) Global Warming Will Affect Ocean/Air Currents and Humidity, Lead to Climatic and Geographic Changes**
  - ▶ **Wintertime Precipitation Increase**
  - ▶ **More Severe Weather Events . . . Increased Rainfall**
  - ▶ **Drought Increase in Number and Severity**
  - ▶ **Northern Snow Cover and Alpine Glaciers Decline**
  - ▶ **Sea Level Rise (0.3 - 0.5 m by 2100)**
  - ▶ **El Niño-Southern Oscillation (ENSO) Increase Frequency**

## **THE HYPOTHESIS (cont'd)**

### **4) Changes will Strain Major Ecosystems**

- ▶ **Decrease in Diversity of Species**
- ▶ **Increase in Number/Range of “Opportunistic” Species**
- ▶ **Relocation, Possible Reduction, of Agricultural Sites**

### **5) Human Health will be Directly Impacted by Climatic Changes**

- ▶ **Suffering and Death Due to Thermal Extremes**
- ▶ **Physical/Psychological Injury, Death Due to Weather-Related Disasters**



## **THE HYPOTHESIS (cont'd)**

### **6) Human Health will be Indirectly Impacted by Physical and Ecological Changes**

- ▶ **Range/Activity of Disease Vectors and Infective Agents Will Increase . . . Alter Range, Intensity and Seasonality of Vector-Borne Diseases**
- ▶ **Increase in Water-Borne Diseases Through Disturbances in Fresh Water Ecosystems**
- ▶ **Population Displacement Due to Rising Sea Level, Regional Declines in Food Production, Weather Disasters . . . Lead to Increase in Malnutrition, Injuries, Infections, Civil Strife**

## **THE HYPOTHESIS (cont'd)**

- ▶ **Increase in Pollen and Spores . . . Lead to Increases in Asthma, Allergies and Other Respiratory Diseases**
  - ▶ **Increase in Particulates and Ozone ... Increased Hospitalizations And Deaths From Cardio-Pulmonary Diseases**
- 7) Combination of Infections, Malnutrition, and Social Stress, Especially in Displaced Groups, May Amplify Health Impacts**

# **BASIS OF DIRECT EFFECTS**

- **Sudden Extreme Increases in Ambient Temps Result in “Excess” Deaths**
  - ▶ **Elderly, Sick, Very Young Have Limited Physiological Capacity to Adapt**
  - ▶ **Urban Poor Lack Escape from Exposure ... “Urban Heat Island Effect”**
  - ▶ **“J-Shaped” Relationship Between Daily Death Rates and Outdoor Temp.**
- **“Threshold Temperature” Proposed: Statistically Derived Temp. Beyond Which Mortality Rises Significantly**
  - ▶ **Varies Regionally: > 86° F, Deaths in NYC ... No Effect in Jacksonville, FL**
- **Other Factors Exacerbate Effect of Heat: High Humidity, Low Wind, Solar Radiation ... “Oppressive Umbrella of Air”**
- **Wintertime Deaths from Influenza and Hypothermia Predicted to Decrease**

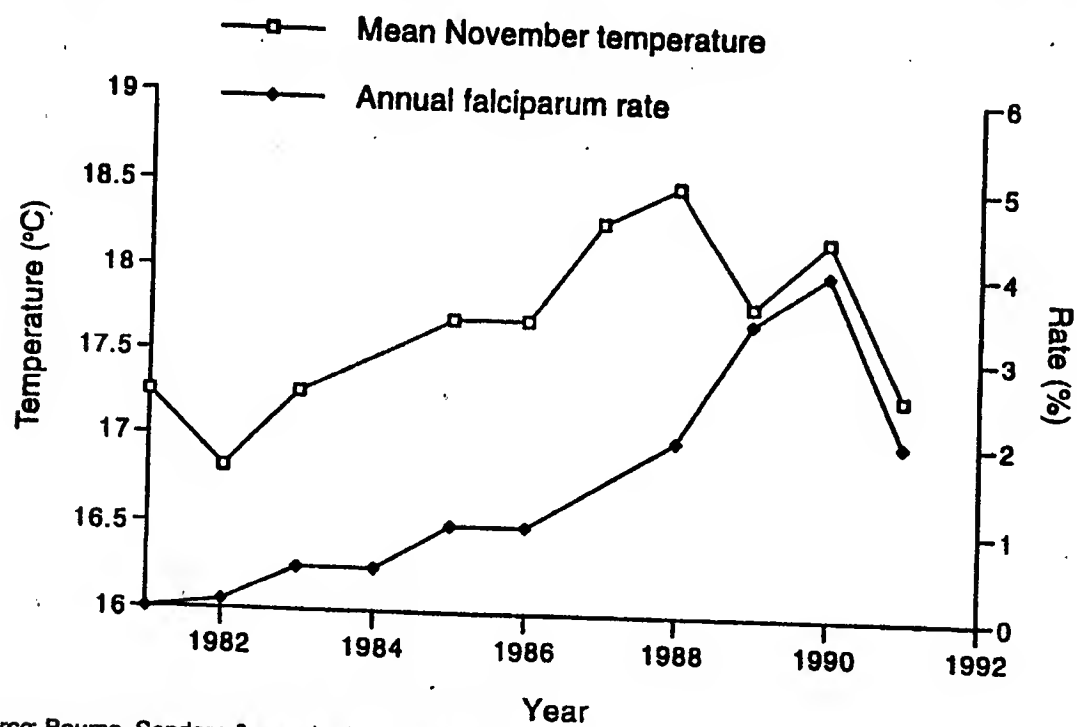
# **BASIS OF INDIRECT VECTOR-BORNE EFFECTS**

- **Evidence Indicates Vector Organisms and Infective Agents Sensitive to Climatic Factors ... Natural Regulatory Forces**
  - ▶ **Temperature:**
    - **Increase Accelerates Metabolic Rate ... Increased Biting Rate For Blood-Feeders, Increased Egg Production**
    - **Longevity Of Female Mosquito Decreases Above 77° F (25°C)**
    - **Arthropods Have Optimal Range . . . Changes in Minimum Temp. Could Be Important**

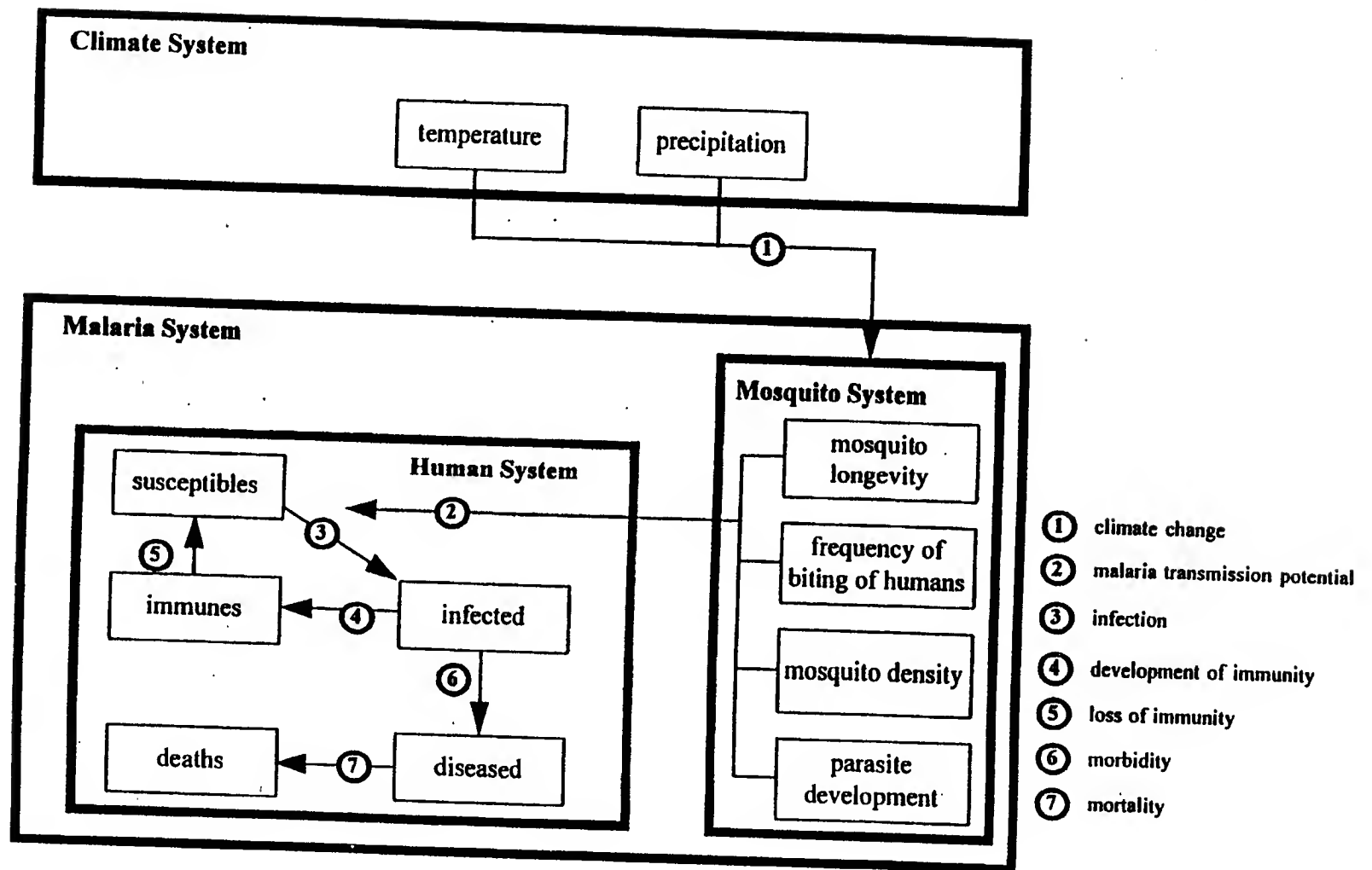
## **BASIS OF INDIRECT VECTOR-BORNE EFFECTS (cont'd)**

- ▶ **Precipitation: Water Critical for Some Breeding Sites: Mosquitoes and Blackflies Have Aquatic Larvae/Pupae Stages**
- ▶ **Humidity: High Relative Humidity Favors Most Metabolic Processes of Vector Organisms, but Infections of Vectors by Fungi Increase**
- ▶ **Wind: Contributes to Passive Dispersal of Flying Insects**
- **Examples Cited Include:**
  - ▶ **Epidemics of Malaria Following Atypically Hot/Rainy Periods**
  - ▶ **Emergence of Rodent-Borne Hantavirus in U.S. (1993)**
  - ▶ **Occurrence of Dengue Fever Doubles with 3 - 4°C Rise**

**Fig. 4.3. Variations in November temperature and annual falciparum malaria rate in north-east Pakistan between 1981 and 1991**



Source: Bouma, Sondorp & van der Kaay, 1994a.



Systems diagram of a model designed to assess the impact of climate change on the potential transmission of malaria (adapted from Martens *et al.*, 1994).

## **BASIS OF INDIRECT WATER-BORNE EFFECTS**

- **Cholera a Major Concern ... Affected by Precipitation Extremes**
- **Marine Plankton as Reservoir for *V. cholerae* ... Usually in Dormant State**
  - ▶ **Higher Sea Temperature ... Increased Plankton Population and Reemergence of *V. cholerae***
  - ▶ **Association Between El Niño and Cholera Outbreaks Actively Studied**
- **Diarrheal Diseases Peak During Hot/Wet Seasons**



# KEY KNOWLEDGE GAPS

## General

- **Predictive Models Largely Unvalidated**

## Direct Effects

- **Significance of “Mortality Displacement” During Excessive Heat**
- **Moderating Effect of Acclimation, Infra-Structural Changes**

## Indirect Effects

- **Better Understanding of Complex Relationship Among Vector, Parasite, Human, and Climate Changes**
- **Extent to Which Human Intervention Can Mitigate Potential Impacts of Climate Change on Health**

## **CONCLUSIONS**

- **Balanced View Not Evident in Peer-Reviewed Journals, Public Media**
- **General Consensus That Climate-Induced Changes in Public Health Extremely Difficult to Quantify**
  - ▶ **Multiple Factors Lead to Wide "Natural" Fluctuations**
  - ▶ **Predictive Computer Models Difficult to Validate, Do Not Reflect Adaptive Response**
- **"Hypothesis" Advocates State Risks are High . . . "Precautionary Principle" Dictates that Lack of Scientific Certainty Can't Justify Postponing Preventive Action**

## **CONCLUSIONS (cont'd)**

- **Minority View: Evidence Must be Weighed . . . Plausible Mechanisms Defined . . .Relative Significance Assessed**
  - ▶ **Climate Change is Likely a Marginal Factor. . . More Critical Issues Exist: Malnutrition, Personal Hygiene, Drug Use, Food Prep, Urbanization, Population Growth, Trade and Travel, Evolution of Microbes, Inadequate Public Health**
- **Impact of Climate Change on Human Health will Remain Speculative . . . Provides a Potentially Emotional Issue**

## **POTENTIAL NEXT STEPS**

- **Monitor and Critique Ongoing Developments**
- **Identify and Critique Relevant Predictive Models**
- **Identify Scientific Leaders with Diverse Views . . . Encourage Active Participation in Debate**
- **Promote Concept of Relative Risk . . . Significance of Climate Impacts Vs. Other Disease Factors**

Summary of Emerging Infectious Disease  
Presidential Decision Directive

- On Wednesday, June 12, the President established a national policy to address the threat of emerging infectious diseases.
- His new policy seeks to combat emerging diseases such as Ebola, drug-resistant tuberculosis, and HIV/AIDS through improved domestic and international surveillance systems, prevention, and response measures.
- The President's action acknowledges that this growing health challenge requires a global strategy as most cities in the United States are within a 36 hour commercial flight of any area of the world--less time than the incubation period of many infectious diseases. Furthermore, the President is seeking to protect the United States from the release of biological agents by rogue nations or terrorists, which could result in the spread of infectious diseases.
- His action is in response to a growing health and national security threat--deaths from infectious disease have risen sharply over the past decade in the United States and globally. In the United States alone, the death rate from infectious diseases, excluding HIV/AIDS, rose by 22 percent between 1980 and 1992. Unfortunately, the factors contributing to the current threat--climate change, ecosystem disturbance, increased movement of people and goods, and the deterioration of public health infrastructures--show no sign of abatement.
- Given the seriousness of this public health threat, the President directed the National Science and Technology Council (NSTC) to conduct a government-wide review of our ability to protect our families from emerging infectious diseases. The NSTC findings and recommendations--published in a report, "Infectious Disease--A Global Health Threat," are the basis of the President's action.
- The President's policy is based on four fundamental pillars. First, we will strengthen the global surveillance and response system--the "over the horizon" radar which allows us to see the threats coming.
- Second, we will strengthen research and training in emerging infectious disease--the key to prevention and management of disease outbreaks.
- The third pillar of the President's policy is to create partnerships with the private sector to promote the development of new drugs and vaccines and ensure sufficient supplies in emergency situations.
- Finally, the President will make the issues of emerging infectious diseases a priority with our international partners.
- The President's policy calls for specific action from 7 different Federal agencies and has wide support from others concerned with protecting the health and well-being of American families.



- 1 Secretary of State for Health. *The health of the nation. A strategy for health in England*. London: HMSO, 1992.
- 2 Dahlgren G. Strategies for health financing in Kenya—the difficult birth of a new policy. *Scand J Soc Med* 1990;46 (suppl):67-81.
- 3 Birley MH. *The health impact assessment of development projects*. London: HMSO, 1995.
- 4 Commission of the European Communities. *Report from the commission to the council, the European parliament and the economic and social committee on the integration of health protection in community policies*. Brussels: CEC, 1995. (COM (95)196 final of 29 May 1995.)
- 5 Rayner M. European Union policy and health. *BMJ* 1995;311:1180-1.
- 6 Karasek R, Theorell T. *Healthy work*. New York: Basic Books, 1990.
- 7 Hillman M. Social goals for transport policy. In: Beatrice A, Gott M, Jones L, Sidell M, eds. *Health and wellbeing: a reader*. Basingstoke: Macmillan, 1993:337-47.
- 8 Watt GCM. Health implications of putting value added tax on fuel. *BMJ* 1994;309:1030-1.
- 9 Department of Health. *Policy appraisal and health*. London: Department of Health, 1995. (EL(95)129/C1(95)47.)
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- 11 Ewan C, Young A, Bryant E, Calvert D. *National framework for environmental and health impact assessment*. National Health and Medical Research Council. Canberra: Australian Government Publishing Service, 1994.
- 12 Milio N. *Promoting health through public policy*. Philadelphia: FA Davis, 1981.
- 13 Robson B, Bradford M, Deas I, Hall E, Harrison E, Parkinson M, et al. *Assessing the impact of urban policy*. London: HMSO, 1994.
- 14 Boothroyd P. Policy assessment. In: Vancly F, Bronstein DA, eds. *Environmental and social impact assessment*. Chichester: Wiley, 1995:83-126.
- 15 Costongs C, Springett J. *A conceptual evaluation framework for health-related policies in the urban context*. Liverpool: Institute for Health, Liverpool John Moores University, 1995.
- 16 Ham C, Hunter DJ, Robinson R. Evidence based policy making. *BMJ* 1995;310:71-2.

## Climate change: not a threat but a promise

### *Doing nothing is no longer an option*

Global warming can no longer be dismissed as a catastrophe theory dreamt up by scaremongers. In the past few months two reports from internationally renowned organisations have offered grave warnings of the threat that climate change poses, within current lifetimes, to humans and ecosystems<sup>1,2</sup>; and last week, in the face of frantic lobbying from the fossil fuel industry, 134 nations, including the United States, agreed to work towards "quantified legally binding" cuts in emissions of the main greenhouse gas, carbon dioxide. What is surprising is how little these concerns have impinged on the media and on our daily lives.

Earlier this month, the Intergovernmental Panel on Climate Change (IPCC) confirmed previous reports that human activity has had a "discernible influence" on the earth's climate, and painted a grim picture of the future if nothing was done.<sup>1</sup> At current rates of increase in the burning of fossil fuels, it will take only another 50-60 years for the levels of carbon dioxide in the atmosphere to reach double the levels present at the start of the industrial revolution. By 2100, the global average surface temperature is predicted to rise by about 2°C and sea level by about 50 cm.

While British newspapers envisioned champagne and sunshine on the British Riviera, a joint report from the World Health Organisation, the World Meteorological Organisation, and the United Nations Environment Programme portrayed more ghastly reality.<sup>2</sup> Health and life will be endangered by heat waves, storms, floods, droughts, worsening air pollution, and shifts in vector borne diseases, causing for example 50-80 million additional cases of malaria each year. The rise in sea level and reduced agricultural production will cause major social upheaval, especially in small island states and low lying areas, and famine, especially in lower income countries.

National responses to such gloomy predictions have varied, but for once Britain is taking a lead. It is one of the few industrialised countries to be meeting commitments made at the Earth Summit in Rio de Janeiro, to cut carbon dioxide emissions to 1990 levels by 2000. In a rousing speech at the United Nations climate change convention in Geneva last week, Britain's environment secretary, John Gummer, called for other countries to honour this agreement and to commit to further cuts—of 5-10% by 2010. "The alarm bells ought to be ringing in every capital throughout the world," he said. His seven point plan for action included removing subsidies on the use of fossil fuels, introducing competition into energy markets, increasing duty on road fuel, and taxing aviation fuel.

There are other signs of a vital shift in the British government's commitment to environmental reform. The environment is now a priority area for the government's strategy document, *Health of the Nation*, and the Department of Transport recently released its National Cycling Strategy, which aims to quadruple the number of trips made by bicycle by 2012.<sup>3</sup>

Several factors have helped to cut Britain's emissions: the shift from oil to gas and nuclear power; campaigns to encourage energy efficiency in homes and businesses; and an annual

increase in taxation on petrol and diesel of 5% on top of inflation. Such initiatives contrast starkly with America's recent decision to lift all taxes on petrol, and the refusal by Australia, New Zealand, and the petrol exporting countries to commit to legally binding reductions.

But while the British government's change in attitude is encouraging, environmentalists doubt the extent of its commitment. Despite the cycling report, there is no sign of an integrated transport policy, nor of a commitment to invest in alternative energy technology. On the contrary, the Department of Trade and Industry recently announced proposals to speed up oil exploration off the British coast.

Greenpeace supports the call from the Alliance of Small Island States for much more radical change. Stabilising emissions is not the same as stabilising concentrations of carbon dioxide in the atmosphere. These will continue to rise, though at a slower rate, even if emissions are stabilised at 10% below 1990 levels. To avoid the disaster predicted by the intergovernmental panel, actual concentrations of carbon dioxide will need to be stabilised at levels less than double those present at the beginning of the industrial revolution. This will require cuts of at least 20% by 2005. The intergovernmental panel says that such cuts are feasible. Up to 30% of energy could be saved within the next two to three decades at little or no cost, and savings of 50-60% could be achieved by implementing existing technologies.

The vulnerable small island states have other less obvious allies. The insurance industry has lobbied for action, spurred on by predictions that two major climate disasters, such as a hurricane in New York City, would wipe out the whole industry.

Conspicuous by its absence has been any sense of urgency in the British media. As the *Observer* newspaper pointed out<sup>4</sup> the daily newspapers have been surprisingly muted in their coverage. "Those papers which greeted the conference by accepting its central thesis assumed they had done enough. Papers which cannot stomach the scientific evidence for global warming ignored it." Whatever the explanation, the public has been left uninformed about a serious issue. In the run up to the last general election, public concern about the environment took third place to concern about taxation and the health service. Climate change will affect us all and must now be a major priority in politics, the media, and medicine.

FIONA GODLEE  
Assistant editor

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- 1 Intergovernmental Panel on Climate Change. *Climate Change* 1995. Cambridge: Cambridge University Press, 1996.
- 2 McMichael AJ, Haines A, Slooff R, Kovats S. *Climate Change and Human Health*. Geneva: World Health Organisation, 1996.
- 3 Department of Transport. *National Cycling Strategy*. London: Department of Health, 1996.
- 4 Greenslade R. Why global warming isn't hot off the press. *Observer* 1996;107:12.

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9/19/96

**IEHR****Institute for Evaluating Health Risks**

John A. Moore, President

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SEP 18 1996

RECEIVED

September 18, 1996

Mr. Leonard Bernstein  
Mobil Corporation  
Fax 703-846-2972

Dear Mr. Bernstein:

In response to your request, during our phone conversation with Bob Drew yesterday, let me briefly provide you with a description of IEHR. The Institute is a non-profit 501(c)3 entity incorporated in the State of California. Our broad goal is to improve the processes used to assess the health risk of agents (usually chemicals). We receive funding from government organizations and the private sector. Private sector funding is in the form of unrestricted grants, in support of specific projects, and for consulting. Government funds are always project specific. We do not serve as expert witnesses on legal matters.

The Institute typically conducts its general projects through the creation of Expert Committees. Two of our projects may be of relevance to your interests as they demonstrate processes used to perform tasks:

1. The Developmental and Reproductive Toxicity Project (DART) developed an *Evaluative Process* which proceeds, in an iterative fashion, through several steps in determining the effects of agents on human health. The use of the process was demonstrated by evaluating several chemicals. The *Evaluative Process* and an evaluation of lithium were published (1995) in the scientific literature. Another evaluation, boric acid and borax, has been accepted for publication (Jan 1997). The development of the *Evaluative Process* was done using a committee of scientists from the government, academia and the private sector. The evaluations of specific chemicals were performed by an expert committee, again drawn from the private, government and academic sectors. The process has received positive reviews. For example, the National Institute of Environmental Health Sciences, NIH, has announced its intent to fund a reproductive and developmental toxicity center and cites the IEHR publications as processes it expects to be employed by the Center. This project received equal funding from governmental and private sources.

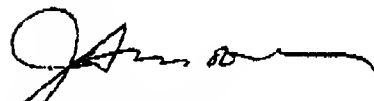
Total of 10 pages

2. IEHR performed a review of the US EPA draft reassessment of the health risks of dioxin and related chemicals. This was accomplished through the use of an expert committee drawn from academia and state health agencies. The formal peer review of the EPA document by its Science Advisory Board, performed after the IEHR effort, are similar as to the nature and content of comments. I have been told by members of the EPA Board that this was not a total coincidence in that they read the IEHR document and found it persuasive as to quality of the committee, issues needing to be addressed, and the clear, unbiased style of writing. Funding for this project was through a grant from the CMA and modest funds from the Illinois Department of Health. This project was performed in 1995.

IEHR, by design, has a small permanent staff. In addition to myself, a key person on a project that focused on the effects of global warming and infectious disease would be my colleague, Dr. Renate Kimbrough. Renate is a physician, well versed in risk assessment, who was a researcher for many years at CDC. Her work at CDC involved chemical and infectious agents.

I hope you find this brief précis on IEHR enlightening. Copies of the material referenced in this letter could be made available to you, should you desire. Other, somewhat dated material, is enclosed. Looking forward to talking to you in the near future.

Sincerely,



John A. Moore

# POLICYMAKING PROFILES

## INSTITUTE FOR EVALUATING HEALTH RISKS

*This is the sixth in a series of articles in which Risk Policy Report will offer detailed profiles of think tanks, research groups, educational organizations, and other institutions involved in helping to shape the understanding of risk assessments and risk management issues.*

### IEHR PLAYS CRITICAL ROLE IN GLOBAL RISK ISSUES

Originally conceived as a scientific entity to help inform California's Proposition 65 law, the Washington, D.C.-based Institute for Evaluating Health Risks has evolved into an organization that is at the cutting edge of national and international risk issues.

When formed in California in 1989 by a group of prestigious California academicians, IEHR was conceived of as providing an expert, unbiased source of scientific information on chemical risks, which its founders believed had become of paramount importance with the recent passage of the state's landmark Proposition 65 toxics law.

But when it became clear for a variety of reasons that the need for such an entity had not materialized, the Irvine, Calif.-based IEHR relocated to Washington, D.C., in May 1991, shifting its focus beyond the Golden State to national and international issues.

Today IEHR is engaged in several major risk activities, including the development of a widely hailed evaluative process for assessing the reproductive and developmental risks of industrial chemicals, risk-ranking efforts at the Department of Energy, and chemical reviews within the Organisation for Economic Cooperation & Development (OECD).

John Moore, president of the nonprofit IEHR, was recruited as IEHR's first staff executive and full-time employee when it got underway in Irvine in 1989, and continues to serve in that capacity today. Moore discussed IEHR's development and some of its key projects in a June 4 interview with *Risk Policy Report*.

IEHR maintains between a six and eight-person staff in its Washington, D.C. headquarters, with Moore and Renate Kimbrough as its two principals. During the 1980s, Moore served as Assistant Administrator of EPA's Office of Pesticides & Toxic Substances and as EPA's Acting Deputy Administrator, and has held senior positions within the National Institute for Environmental Health Sciences. Prior to joining IEHR, Kimbrough held positions both within EPA and the Centers for Disease Control.

IEHR gets its funding from both private sector and government sources. "A core of private sources has given us unrestricted grants on an annual basis," Moore says, explaining that while this has not amounted to a huge sum, "it allows us the flexibility" to pursue projects as they may arise.

One of IEHR's major contributions and earliest projects was the development of a now widely-hailed process for assessing the potential reproductive and developmental risks from chemical exposures. Moore says IEHR convened government, academic and private sector scientists from around the country for an exploratory meeting in December of 1989, which resulted in the consensus that there was a need for action in the area of reproductive and developmental toxicity and risk assessment. IEHR succeeded in obtaining a 50-50 mix of funding from government and private sources to develop a document labeled "An Evaluative Process for Assessing Human Reproductive and Developmental Toxicity of Agents,"

which it in turn followed up with a look at some pilot chemicals to assess the real-world impact of such a process.

Moore attributes the success of the document to the fact that it results in "a very transparent process" if it is followed properly and the fact that it was crafted through a collegial process drawing on a broad spectrum of experts, including international scientists. "If you look at this paradigm, its utility to endpoints beyond reproductive and developmental toxicity is just as plain as the nose on the end of your face — the intellectual processes involved in when you collect data, the process to review the data — it serves just as well the endpoint one wants to chase," Moore says of the applicability of the "evaluative process" to other risk endpoints.

A recent major project for IEHR has been its involvement with a Department of Energy-funded university-based consortium, the Consortium for Risk Evaluation with Stakeholder Participation (CRESP), whose goal is "to provide an unbiased source of scientific expertise" dealing with the legacy of nuclear production at DOE sites such as Hanford, Savannah River and Rocky Flats. "A major problem DOE has is not being viewed as credible by the public," Moore says, explaining that the CRESP process serves as an independent source of knowledge and judgment on issues of great public interest. Moore adds that he also just finished chairing a review panel for a DOE process that tries to use a comparative risk approach "to score, rank and prioritize what should be done at various sites across the country." He notes that the consortium has "strongly endorsed the conceptual aspects of trying to use risk" to influence the decision process.

IEHR is also updating a large General Electric Co. cohort on polychlorinated biphenyls (PCBs) and capacitor workers that should be completed by the end of this year, Moore says. He expects the findings could be particularly interesting since there are "a fair number of females in that cohort" — unusual for this sort of occupational exposure cohort — raising the possibility that the female portion could be "teased out" and offer important new information. Moore notes that PCBs have been implicated in "endocrine disruption," a phenomenon that occurs when hormonal

# Policymaking Profiles

systems are affected by exposure to certain chemicals and one that is receiving increasing attention for potential effects on reproductive, developmental and immune system health. Moore says IEHR has been involved peripherally in the debate over endocrine disruptors. "We've known endocrine modulation can impact the results of our two-year studies," Moore comments, adding, "It's been 20 years now since FDA identified the fact that rat mammary tumors would be heavily discounted if they could associate them with a prolactin-type response."

Moore describes IEHR as having a "secondary policy role," explaining that, while the organization does not offer up policy papers, IEHR has been active in California's comparative risk process and in DOE's risk ranking efforts.

A major focus for IEHR has been on international harmonization developments. Moore has been heavily involved with OECD's existing chemicals initiative, chairing since 1989 every OECD "SIDS" [Screening Information Data Set] meeting, evaluating where the data gaps are or what the data are. He describes this as an effort to leverage money from a variety of countries to share the

basic information needed to make a "first-cut decision" on whether a chemical should be "set aside" and removed from further consideration, without the fear that it might "come back to bite you." There are now data on the table for many chemicals, Moore notes, and he emphasizes that the OECD — while not the traditional sort of mechanism associated with risk assessment — has "the unique opportunity" to make progress on risk-related issues.

One of the most pressing issues facing the field of risk assessment is the need to "get the politics out of it," Moore believes. He calls last year's foiled congressional efforts to pass risk/regulatory reform legislation "a sad commentary." While Moore believes legislation is warranted, he says the proposals to emerge last year were so "overreaching" as to extinguish any chance for reform, and laments that "we as a country are all the worse for it." In closing, Moore emphasizes that there is a need for some sort of mechanism to ensure a consistent approach to risk assessment. "Risk assessment is a tool that should constantly be changing to some degree based on new scientific information," he comments.

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## Commentary

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### ONE SIZE DOES NOT FIT ALL: SOME IMPLICATIONS OF THE REPORT OF THE NATIONAL RESEARCH COUNCIL COMMITTEE ON RISK CHARACTERIZATION

by James D. Wilson

*Note: These remarks are the views of the author and not necessarily those of Resources for the Future.*

Conventional wisdom holds that all risk assessments should follow a set pattern: a hazard identification is followed by a dose-response assessment, which is then combined with an exposure assessment to yield a risk characterization, usually an estimate of how likely it is that some hypothetical representative individual from some chosen population will die. This fiction was once useful, serving to introduce a measure of analytical discipline into a young Environmental Protection Agency's decisions.

That the pattern does not come close to representing reality for all risk decisions has been apparent to many since its promulgation a dozen years ago in the National Research Council's "red book," *Risk Assessment in the Federal Government: Managing the Process*. For example: Analyses to support safety decisions in agencies such as the National Highway Traffic Safety Administration (NHTSA) don't track this pattern. Nor do analyses conducted by the Agriculture Department's Animal and Plant Health Inspection Service (APHIS), which regulates import of living plants and animals. Moreover, the "red book" paradigm is built upon the implicit assumptions that "exposure" to hazards will almost certainly occur, and that such exposures can have negligible consequences, but neither assumption holds when risks from improbable events are to be managed, as NHTSA and APHIS do. Now, the recently-released report of the National Research Council's Committee on Risk Characterization — the latest to paddle in the murky waters of risk assessment — makes it clear that the "red book" paradigm has limited utility for much of human health risk assessment, as well.

*Understanding Risk: Informing Decisions in a Democratic Society*, as this report is titled, emphasizes two observations that many of us in the profession believe must be integrated into our thinking if the profession is to thrive. First: risk assessments need to be structured by the decisions that ultimately will be made and that the assessments are intended to inform. Second: these decisions are not all alike. Not surprisingly, these two observations carry significant implications for how the risk analysis process is organized and carried out in EPA and other regulatory agencies.

*James D. Wilson is Senior Fellow at the Washington, D.C.-based Center for Risk Management, Resources for the Future.*

# IEHR BULLETIN

Vol. 1, No. 2, October 1991

The Institute for Evaluating Health Risks

## IEHR Performs Lead Study for Illinois Department of Public Health

IEHR received a grant from the Department of Public Health of the State of Illinois to study blood lead levels in children. The project began in late August and will continue through 1992. Dr. Renate Kimbrough serves as the Principal Investigator for the study with the help of Co-Investigator, Dr. Maurice Le Vois.

The study measures and examines blood lead levels and other biochemical parameters in humans living in Granite City, Illinois. Approximately 800 people, predominantly children under six years of age, will be tested. The subjects are presumed to have been exposed to higher environmental lead levels than the general population.

High blood lead levels in humans can occur via many routes of exposure, such as house dust, drinking water, interior and exterior paint, and the soil of the subject's immediate environment. An attempt will be made to determine the correlation between the amount of lead contained in these sources and human blood lead levels.

At present, the contribution of lead uptake from soil to overall lead exposure is not clear. The variables affecting lead uptake from lead in soil are concentration of the lead in soil, particle size, form of lead, and presence of other trace elements. For plants, soil pH is also important. Other factors to consider are natural barriers such as grass and bushes.

House dust is thought to be the primary vehicle through which children are exposed. House dust is a combination of soil from the outside, lint, fragments from carpets and upholstery, soot, hair, paint particles, and other particles from the house. In many reports of previous studies, the relationship between levels of lead in dust and lead in soil was not clearly defined. This study will attempt to address the implications of such a relationship.

The grant is part of a larger study at two additional sites in Missouri and Kansas, coordinated by the Agency for Toxic Substances and Disease Registry (ATSDR). It is hoped that the results of this three-site study will provide a better understanding of the various pathways through which children are exposed to lead.

Ultimately, the results of these and other studies will make it possible to reduce the uncertainties of the assessment of lead exposure of humans living in or adjacent to contaminated areas such as "superfund sites".

## PCB Cancer Reassessment Completed

On July 1 IEHR announced the results of its project that reassessed the pathological diagnoses of five key PCB chronic studies in rats. These studies were selected because they had either been utilized or discussed in previous EPA risk assessments and they represent the best studies for evaluating the cancer potential of these mixtures of chemicals.

In this project, an expert group of pathologists reviewed the diagnoses of liver lesions utilizing current pathology conventions promulgated by the National Toxicology Program and endorsed by the Environmental Protection Agency. The pathologists reached a consensus diagnosis for each animal with liver tumors, permitting greater confidence that differences in tumor incidence and type in each study are due to differences in the test substance.

The major findings were: 1) The reassessment reaffirmed that three different studies with 60% chlorinated PCB formulations resulted in the development of liver tumors. The incidence of tumors was moderately decreased. 2) PCB formulations with 54% chlorination did not yield a statistically significant increase in either benign or malignant tumors. In addition, the reassessment clarified the significance of "nodular hyperplasia", a term utilized in the original study. 3) PCB formulations with 42% chlorination did not yield a statistically significant increase in either benign or malignant tumors.

The results of the reassessment were submitted to both EPA and FDA. The transmittal letter to EPA recommended reconsideration of the Agency's traditional PCB cancer risk policy; particularly the assumption that all PCB formulations are probable human carcinogens and, that all PCB formulations have the same quantitative potency to cause cancer. Analysis of the reassessment results provides no scientific support for a continuance of these policies.

*Copies of this report are available upon request.*

## Institute Internship Program

Elisabeth Reese, a graduate student in the University of Michigan's School of Public Health, spent the summer as IEHR's first intern. Reese, under the direction of Renate Kimbrough, researched existing literature and prepared a draft document on the acute toxicity of selected constituents of gasoline. The document will be part of a presentation given by Renate Kimbrough at the International Health Effects of Gasoline Symposium. *[Continued on page 2]*

## Internship Program (Continued)

IEHR plans to offer similar internships in future years, and is also considering the establishment of a postdoctoral position for an individual interested in risk assessment or risk policy issues. Inquiries regarding opportunities for sabbatical positions or IPA assignments will also be considered.

## IEHR's Newest Initiative: Predicting Bioaccumulation of Lipophilic Chemicals

The Institute is proceeding with the planning of a Conference that will address and hopefully resolve many issues associated with the bioaccumulation of persistent lipophilic chemicals in aquatic biota. A primary goal is to improve the accuracy of the procedures used for estimating toxicant bioaccumulation. Such estimates are of major importance in water permit writing, hazardous waste site evaluation, screening new chemicals for environmental risks, and sediment dredging decisions.

A planning meeting, to be held in late October, will establish the Working Conference's format and potential participants. The target date for the Conference is first quarter, 1992. A number of organizations have expressed interest in participating in the Conference planning; a number have also indicated plans for financial support. These organizations are: American Paper Institute, American Petroleum Institute, Electric Power Research Institute, Environmental Protection Agency, Food and Drug Administration, National Council of the Paper Industry for Air and Stream Improvement, National Institute of Environmental Health Sciences. IEHR's contact for the project is Christie Drew.

## IEHR Cited as Key Bridging Institution

The formation and emerging role of IEHR is described in detail in an essay, *The Role of NGO's in Improving the Employment of Science and Technology in Environmental Management* published this summer by the Carnegie Commission on Science, Technology and Government. The 50-page monograph, authored by Charles W. Powers, describes IEHR as one of five institutional innovations that bridge conflicts when involved parties recognize the inability of any one sector to solve persistent and fundamental health and environmental disputes. The Carnegie paper suggests that risk assessment is the bridge concept that links emerging scientific data and risk management decisions. However, the ability of this concept to serve in this role was foundering because its execution had been held close by government and sharply criticized by diverse private interests. IEHR was developed as an institutional mechanism with a governance structure and mission which is permitting the risk assessment process to be dynamic and move forward

toward more scientific consensus and public confidence. Copies of the report can be obtained by writing Jesse Ausubel, Director of Studies, at the Carnegie Commission, 10 Waverly Place, New York, NY, 10003.

## International Meeting on Hazardous Wastes

Jack Moore recently served as Chairman of an international scientific group that focused on methods for developing approaches to the management of hazardous waste. A primary emphasis was to identify approaches and methods that would be of utility to managers and public health officials in developing countries. The results of the activity will be published in book form within eighteen months.

The working group was convened under the aegis of the Scientific Group on Methodologies for the Safety Evaluation of Chemicals (SGOMSEC). SGOMSEC receives administrative and financial support from the International Program on Chemical Safety, WHO; the United Nations Environmental Program; the National Institute of Environmental Health Sciences, NIH, and the U.S. Environmental Protection Agency.

The meeting, held in Cairo, Egypt, involved scientists from Belgium, Canada, Czechoslovakia, Egypt, Finland, France, Germany, India, Mexico, the Netherlands, Switzerland, the United Kingdom, and the United States.

## Institute Potpourri

- Dr. Maurice Le Vois joined the IEHR scientific staff during July. Le Vois, a biostatistician epidemiologist, serves as Co-Investigator on the Illinois Lead Study. Dr. Le Vois' expertise in epidemiology, behavioral psychology, and biostatistics will be a great asset to the Institute. Previously, Le Vois has worked with environmental consulting firms, the Red Cross, Centers for Disease Control, and the Veterans Administration.

- Christina H. Drew has joined IEHR as a junior staff member. A recent graduate of the College of William and Mary, (Major: Government) she is most interested in the policy element of IEHR. Her projects include the Bioaccumulation Conference, support for the Illinois Lead Study, and production of the IEHR BULLETIN.

- The American Conference of Governmental and Industrial Hygienists awarded Dr. Renate Kimbrough the Herbert E. Stockinger Award in May, in recognition for outstanding contributions to industrial and environmental toxicology. At the ceremony, Kimbrough gave a presentation entitled "Uncertainties of Risk Assessment", which will be published in the September Issue of Applied Occupational and Environmental Hygiene.

[continued on page 4]

## DART PROJECT UPDATE

### Overview

IEHR continues to make progress with its project to develop an Evaluative Process for Developmental and Reproductive Toxicants. Known by the acronym DART, this study has four critical objectives:

- develop an evaluative process incorporating robust use of scientific knowledge to determine which chemicals potentially threaten to cause reproductive or developmental toxicity;
- develop a means of communication that clearly conveys the basis for the scientific judgement that a chemical may pose such a threat;
- achieve the previous objectives through a process that involves a scientific consensus from academia, government, and the private sector;
- recommend the best way to achieve broad acceptance of these consensus approaches, including issues such as consistency, and mechanisms for proper revision to reflect evolving scientific knowledge.

A summary of activities, many of which are developed or reviewed by either a DART Management or Steering Committee is provided below.

### Management Committee

**Members:** William Farland, *EPA, [Chair]*  
 Peter Galbraith, *Connecticut Dept of Hlth*  
 Bob Scala, *Exxon Biomedical Sciences*  
 Phil Watanabe, *Dow Chemical*  
 Jim Wilson, *Monsanto*

The Management Committee has four major functions: 1) provide managerial and policy perspective on the project's activities; 2) organize and host a meeting that will permit discussion and comment on the draft evaluative process; 3) participate in the organization of the pilot chemical evaluation phase; and, 4) develop recommendations on how to realize broad and effective use of the evaluative process.

The Management Committee met in August to review the progress of the DART project and commenced planning for a meeting that will permit discussion of the draft evaluative process and potential mechanisms for achieving broad implementation. The meeting is tentatively scheduled for March/April 1992.

Reaffirming its strong support for achieving international representation and participation in the review of the draft evaluative process and in the pilot chemical evaluation phase, the committee is actively soliciting participation of scientists experienced in the needs of the public and environmental health community.

The committee voted to broaden its membership with Dr. Peter Galbraith, of the Connecticut Department of Public Health, and Dr. Robert Scala from Exxon Biomedical Sciences agreeing to join the Committee. The next meeting is scheduled for October.

### Steering Committee

**Members:** Elaine Faustman, *Univ. of Washington*  
 Bill Hart, *Eastman Kodak*  
 Claude Hughes, *Duke University*  
 Carol Kimmel, *EPA*  
 Jim Lamb, *Jellinek Schwartz Connolly and Freshman*  
 Jack Moore, *IEHR [Chair]*  
 Tony Scialli, *Georgetown University*  
 Bern Schwetz, *NIEHS (liaison)*

The DART steering committee is responsible for the technical and scientific aspects of the project. The principal task continues to be development of the draft evaluative process, which will be released for comment in January, 1992. The Committee has also developed a potential list of candidate chemicals for the pilot evaluation phase of the project.

### Scientist Joins IEHR & DART Project

Dr. Marlissa Campbell joined the IEHR staff on October 1 to work on the scientific and technical issues associated with the DART Project. As such, she will be working most closely with the Steering Committee members. Marlissa earned her Ph.D. at the University of Washington and has subsequently had positions with NIH, and the U.S. EPA where she performed as a reproductive and developmental toxicologist. She most recently held a position as a toxicologist/advisor with the National Farmers Union, London, England. Dr. Campbell will continue to live and work in England, an arrangement made possible by electronic information transfer technology.

### Funding

A unique aspect of the DART project, which commenced in the fall of 1990, was a commitment by IEHR to achieve equal funding from the Federal Government and the private sector. Federal Funding was received from the U.S. Environmental Protection Agency and the U.S. Department of Agriculture. The initial source of private funds was a grant from the American Industrial Health Council. Specific funds for this project have also been received or pledged from Coca Cola, Dow, Eastman Kodak, Exxon, Ford Motor Company, Hoechst Celanese, Merck & Co, Monsanto, OxyChem, Rhone-Poulenc, Rohm and Haas.



## DART Project Update (Continued)

### Pilot Chemicals

A key element in the development of the evaluative process is to test its effectiveness by evaluating a set of chemicals. One can best learn how utile the process is by assessing a range of chemical types that have varying amounts of toxicity data. It will also permit the IEHR project to demonstrate how evaluative judgements should be effectively and objectively communicated.

The Management and Steering Committee recommend that the pilot chemicals include at least one drug, one pesticide, a metal, and a chemical "class". Several dozen chemicals were considered in the development of a "candidate" list of eleven chemicals. Five or six chemicals will soon be selected for the pilot evaluation.

### Candidate Chemicals

aspirin	cyanazine
boric acid	dinocap
bromoxyynil	ethylene glycol
caffeine	ethylene oxide
carbon disulfide	mercuric chloride
phthalate esters as a "class"	

Comments are welcome on the suitability of specific chemicals on the candidate list. If you believe there may be a chemical, which is not on the list, that would serve as a superior pilot chemical, please share your thoughts with us. Please remember the objective of the pilot phase is primarily to ascertain the utility of the evaluative process. As such there is a need to pick chemicals that have varying amounts of data on each of the end points, i.e. developmental toxicity, male reproductive toxicity, female reproductive toxicity.

Exposure data differences are also a major selection criteria; it is believed that selecting from a range of materials (drugs, pesticides, metals, and to some degree a chemical class) will provide the desired range of data. It is anticipated that the pilot chemical evaluations will be performed in mid to late summer of 1992.

### Institute Potpourri (Continued)

Jack Moore spoke at the Summer Toxicology Forum, Aspen, Colo. Addressing international activities with existing chemicals and their "safety". He stated that an impediment to progress was the paralysis that seems to occur due to the overwhelming number of chemicals to be assessed. He opined that an OECD initiative is making real progress due to three key factors. First was an agreement to prioritize chemicals based on production volume. Second, getting consensus on the type of information needed for initial decisions - the OECD Screening Information Data Set (SIDS) has been developed for this purpose. Third, determining the initial decision is not to determine "safety". Rather, it is to select those chemicals that, based on modest amounts of data, are worthy of further examination or may be "set aside" with little likelihood that they represent major toxic potential.

Moore also outlined IEHR's DART project in a second presentation at the Toxicology Forum.

Renate Kimbrough's commentary entitled, "A critical look at Biomarkers" was published in *Health and Environment Digest*, Volume 5 No 7 (Aug-Sept 1991). The article discussed the usefulness of biomarkers in predicting disease in the individual. Kimbrough cautioned against over interpreting abnormal results when measuring biomarkers.

## The Institute for Evaluating Health Risks

Suite 608, 1101 Vermont Ave., N.W., Washington D.C. 20005

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The Institute for Evaluating Health Risks is based in California, but the work it conducts is also national and international in scope and reach.

Risk assessment is a tool to be used in applying a systematic approach to the evaluation of chemicals for potential adverse health effects. It should embrace the rigorous application of scientific and technical knowledge. Processes which employ these techniques, and the results of such applications, have universal utility in our chemical society.

Proposition 65, the ballot initiative overwhelmingly passed by California voters, certainly puts a premium on the identification of chemicals which may cause cancer or are reproductive toxicants. It also requires the quantitative estimate of a level which does not cause significant harm. Risk assessment procedures are acknowledged to be the preferred approach for making such determinations. While Proposition 65 may highlight the need for these vital evaluations, essentially all federal laws, ranging from pesticides to air, from water to waste disposal, also utilize these procedures of evaluation.

IEHR intends to provide the scientific leadership which can result in uniformity and reliability in California and across the nation. Already working and consulting with scientists and leaders from coast to coast, and beyond our borders, IEHR is indeed leading the way.

## Funding

The Institute for Evaluating Health Risks is supported by public funds, private donations, foundation awards, and corporate charitable contributions. IEHR is a tax deductible charitable organization under Internal Revenue Service regulation 501(c) (3).

IEHR welcomes support for its work. For complete information about support for the vital efforts of IEHR, contact the Institute at:

**IEHR**  
100 Academy  
Irvine, California 92715  
(714) 725-9075

# THE INSTITUTE FOR EVALUATING HEALTH RISKS

# IEHR

INTEGRITY  
INDEPENDENCE  
EXCELLENCE

**The Institute for Evaluating Health Risks** is the nation's first non-profit agency dedicated exclusively to the scientific evaluation of health risks associated with exposure to chemicals.

Few environmental issues facing contemporary society are as compelling or as complex as those which attend health risks arising from exposure to chemical substances. The issue results from a simple fact of modern life: Virtually every activity — going to work, raising a family, eating an apple or drinking a glass of water — results in exposure to chemicals. That exposure can, in some instances, generate some degree of health risk.

The system of evaluating health risks associated with chemical exposure has grown ever more complex. A growing national awareness of the problem and demands for protection have resulted in a body of public policy and law which is often chaotic, confusing, and inconsistent. While all policy

and law demand the answers to three basic questions — can a given chemical cause a health risk? if a health risk is caused, what is the nature of that risk? what level of exposure creates that risk? — the process of providing answers to these questions has been perplexing and disquieting.

All too frequently, each inquiry into the chemical/health risk equation follows a predictable course. Competing scientific assertions, all seemingly based on reputable scientific data, result in contrary conclusions and a growing public suspicion that those evaluating a chemical are influenced by a variety of factors beyond pure scientific inquiry.

IEHR exists to overcome that perplexing pattern of competing assertions and to replace the environment of mistrust with pristine evaluations upon which every segment of the public can confidently rely.

### **A Framework For Trust**

The Institute for Evaluating Health Risks must gain trust in circumstances where emotions are high, motives are suspect, and polarized points of view abound. To achieve this goal, IEHR must build from a foundation of integrity, independence, and excellent science. Its work must be accessible and explained in terms which are generally understood.

IEHR is a "public interest" institution in the finest sense of the phrase. It is not directed by industry, it is not governed by cause centered activists, it is not a government agency. IEHR works with all segments of society concerned about health risks and chemical exposure, but IEHR does not work for any one of those segments.

The IEHR Board of Directors is composed of recognized, reputable leaders from the academic, industrial, and environmental sectors. These leaders have joined together to create an organization which develops and identifies the best available methodology with which to evaluate health risks and applies those methods in the most objective fashion, regardless of the result. No special interest dominates the governance of IEHR's work, although all special interests contribute to the effort.

Working primarily through an expert committee structure, IEHR is committed to seeking the participation of individuals who represent the best science has to offer wherever they may reside: academia, industry, public interest organizations, or government.

IEHR is dedicated to the proposition that this framework of independence and unwavering scientific inquiry can, and will, produce accurate and reliable health risk assessments which do not result in the frustrating pattern of charge and counter-charge.

**Announced IPCC Activities 1996- 1997****Meetings**

- |  |                    |
|--|--------------------|
| 1. IPCC Workshop on regional climate change projections for impact assessments | Sept 24-26, London |
| 2. IPCC Working Group II and Main Plenary                                      | Sept 1997          |
| 3. IPCC Bureau   | Nov 7-8, 1996      |
| 4. IPCC Bureau   | Jan 30-31, 1997    |

**Special Reports**

- |   | <u>Expected Completion Date</u> | <u>Purpose</u>         |
|---|---------------------------------|------------------------|
| 1. Global Atmospheric Effects of Aviation | Sept 1998                       | ICAO/Montreal Protocol |
| 2. Emissions Scenarios                    | Sept 1998                       | TAR                    |
| 3. Regional Impacts of Climate Change     | Sept 1998                       | SBSTA                  |
| 4. Technology Transfer                    | Feb 1997                        | SBSTA                  |

**Technical Papers**

- |  |          |       |
|--|----------|-------|
| 1. Policies and Measures   | Nov 1996 | SBSTA |
| 2. Modeling of stabilization scenarios                             | Nov 1996 | SBSTA |
| 3. Environmental implications of emission limitations              | 1997     | SBSTA |
| 4. Simple climate models   | Nov 1996 | SBSTA |
| 5. Regional impacts of climate change                              | Feb 1997 | SBSTA |
| 6. Methodological and technological aspects of technology transfer | Feb 1997 | SBSTA |

**Workshops**

- |  |               |            |
|--|---------------|------------|
| 1. Regional Climate Change Projections for impact assessment   | 3rd Q. 1997   | SBSTA/ TAR |
| 2. Adaptation  | 1997          | SBSTA      |
| 3. Economic Impacts of Annex I Actions on developing Countries | Late 2Q. 1997 | SBSTA      |
| 4. Integrated Assessment Modeling                              | March 1997    | SBSTA      |
| 5. Integrated Assessment Capacity Building                     | 1997-2000     | START      |
| 6. Mitigation and Adaptation cost assessment guidelines.       | April 1997    | TAR        |
| 7. Integrated Assessment Modeling (workshop II)                | 1998          | SBSTA/TAR  |
| 8. Workshop on Rapid non-linear change                         | Mar-Apr 1998  | SBSTA/TAR  |
| 9. Role of oceans and coral reefs in the carbon cycle          | ?             | TAR        |

**Scoping Papers**

- |  |           |       |
|--|-----------|-------|
| 1. Technology Assessment (expert group meeting)  | Sept 1997 | TAR   |
| 2. Scientific information relevant to the interpretation of dangerous levels of GHG concentrations in the atmosphere on the climate system | Sept 1997 | TAR   |
| 3. Risk management techniques for decision-making under uncertainty.   | 1997      | TAR   |
| 4. IAEA full fuel-cycle emissions  | late 1997 | other |



## FAX MEMO

7/17/96

To: Lenny S. Bernstein	Pages Sent: 7
From : Bronson Gardner	Phone / Fax Number : 216-475-9674
Subject : Side by Side Comparison	Internet Address: gardnerb@ix.netcom.com

Attached is a detailed "side by side" comparison of the comments submitted by the GCC and the U.S. government on National Communications and the documents produced at COP2. The short story is that the Annex I document appears to respond well to most the comments, but the Annex II comment does not respond well to most of the comments.

Bronson

L.S. BERNSTEIN

SEP 17 1996

RECEIVED

Bronson Gardner  
13965 Milo Road  
Garfield Heights, Ohio 44125

AIAM-051538

To: Connie Holmes, Bob McFadden, John Shlaes  
From: Bronson Gardner  
Re: Side-by-Side review of COP-2 Decisions on National Communication Guidelines

I have compared the decisions made at COP-2 regarding National Communication Guidelines with statements made by both the GCC and the U.S. Attached is comparison of requests made by the U.S. and the GCC (in bold) with the actual language of the guidelines (non-bold).

### **Proposals for Annex I Parties**

- **"Increasing transparency, comparability, and consistency through more specific reporting guidelines". (U.S. and GCC)**

"The transparency of national communications is fundamental to the success of the process for communication and consideration of information. (page 3, Annex I).

"Where methodological or data gaps exist, information should be presented in a transparent manner." (page 3, Annex I).

"In the interest of transparency, Parties should include baseline projections, indicating, using Table 1, which measures are included and which measures are additional to these baseline projections". (page 8, Annex I).

"Parties are encouraged to use the IPCC Technical Guidelines for Assessing Climate Change Impacts and Adaptations". (page 9, Annex I).

- **Greater Specificity on Individual Measures : Overall (GCC)**

"The national communications should describe all of a Party's policies and measures implemented or committed that the Party believes contribute significantly to its efforts to reduce emissions and enhance sinks of greenhouse gases." (page 5, Annex I).

"The overall policy context for the policies and measures adopted should be presented. These could include reference to other relevant policies as well as elaboration of national greenhouse gas targets. (page 5, Annex I).

"Parties should: (b) provide enough information to allow a third party to obtain a qualitative understanding of the model(s) and/or approaches used and their relationship to each other; (page 9, Annex I).

"To ensure transparency, national communications should include enough information to provide a third party with a quantitative understanding of the key assumptions used to develop projections(s) of greenhouse gas emissions and removals and estimates(s) of the total effects of policies and measures on emissions and removals." (page 9, Annex I).

- **"Each National Communication should include a statement of specific assumptions made in preparing the plan." (GCC)**

"To ensure transparency, enough information should be provided to allow the reconstruction of the inventory from national activity data, emission factors and other assumptions, and to assess the results." (page 4, Annex I).

"To facilitate transparency, enough detail should be provided about each individual policy and measure described in the text of the nation communication to allow a third party to understand the action's objective and degree of implementation, as well as how the greenhouse gas effects of the action will be monitored over time." (page 7, Annex I).

"Parties should indicate in what way activities by the private sector help meet the commitments of Parties under Article 4.3, 4.4 and 4.5 of the Convention." (page 11, Annex I).

"Although not explicitly required by the Convention, a Party may wish to provide other information relevant to its greenhouse gas emission/removal profile. This would permit readers to put the information on its implementation of the Convention in context, could help to explain certain trends and would provide data valuable in the analysis and aggregation of the submissions." (page 12, Annex I).

- **"Initiating a process to resolve areas of inconsistency in reporting, such as temperature adjustments, bunker fuels, electricity imports, and global warming potentials". (U.S.)**

#### **"Reporting of emissions on a consistent basis" (GCC)**

"To facilitate the process of considering the national communications, including the preparation of useful technical analysis and synthesis documentation, by encouraging the presentation of information in ways that are consistent, transparent and comparable;" (page 1, Annex I)

"If Parties carry out any adjustments to inventory data, for example for climate variations or trade patterns in electricity, these adjustments should be reported in a transparent manner, with clear indications of the methods followed" (page 2, Annex I).

"...the level of uncertainty associated with these data and underlying assumptions should be discussed qualitatively and, where possible, quantitatively". (page 3, Annex I).

"Annex I Parties should follow the IPCC Guidelines for National Greenhouse Gas Inventories with respect to the presentation of methodologies, activity data, emission factors and other assumptions." (page 4, Annex I).

"Parties are encouraged to include separately projections of emissions from international bunker fuels and/or provide information which will facilitate international projections of bunker fuel emissions".

- **"Being able to analyze the global implications of national plans requires that national communications include comparable estimates of emissions and their reductions (GCC).**

"Countries that already have an established and comparable methodology could continue to use that methodology, provided that they provide sufficient documentation to back up the data presented....Standard tables and formats recommended in the IPCC Guidelines for National Greenhouse Gas Inventories should be used for presentation of data." (Annex I, page 4).

- **Greater Specificity on Individual Measures : Through what mechanisms the action is expected to affect emissions (GCC)**

"(e) how the measure is expected to function or is functioning" (page 7, Annex I).

- **Greater Specificity on Individual Measures :How much each action is expected to affect emissions and how those effects are expected to change or phase-in over time (GCC)**

"(g) A quantitative estimate of the mitigation impact of the policy or measure or, if unavailable, a ranking of individual policies and measures according to their relative importance in mitigation (page 7, Annex I).

- **Greater Specificity on Individual Measures :What side effects on the national economy or society the action is expected to have. (GCC)**

"(h) Information (including details of the calculation methodologies) relating to the cost of the policy or measure, to the extent possible". (page 7, Annex 1).

- **Greater Specificity on Individual Measures :What related actions the action is dependent upon, and how the action interacts with other national actions (GCC)**

"The overall policy context for policies and measures adopted should be presented. This could include reference to other relevant policies as well as elaboration of national greenhouse gas targets". (page 5, Annex 1).

"(f) Monitoring through intermediate indicators of progress for policies and measures. (These may be related to legislative processes, emissions-related activities or the broader objectives of policies and measures;" (page 7, Annex 1)

"(c) how the policy or measure interacts with other policies and measures described;" (page 7, Annex 1).

- **Importance of National Circumstances (GCC)**

"(d) Status of implementation of, and/or commitment to, the policy or measure. (This should, where appropriate, make reference to a section of the national communication related to national circumstances that describes the policy-making process in the country or organization)." (page 7, Annex 1).

- **"Reducing the compilation and synthesis burden on the Secretariat by reporting data in electronic form and increasing the use of tables." (US)**



"If possible, data should also be provided in an electronic version which is compatible with the requirements of the secretariat." (page 4, Annex I).

"Parties should use table 1 in Appendix III and to summarize the information provided on policies and measures, with all fields of the table completed, to the extent possible." (page 7, Annex I).

"Parties should summarize the projections data in accordance with the categorization in the summary tables of the IPCC Guidelines on National Greenhouse Gas Inventories, using table 2 to 7 in appendix III." (Page 8, Annex I).

"Parties should, to the extent possible, summarize key variables and assumptions by completing table 8 in Appendix III). (page 9, Annex I).

### Proposals for Annex II Parties

- **Non-Annex I parties should develop comprehensive National Communications.**
- **The communications should address all greenhouse gases, and not focus mainly on carbon dioxide (GCC)**

"...the communication should include:

- (a) A national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit, using comparable methodologies to be promoted and agreed upon by the Conference of the Parties" (page 4, Annex II).
- **The communication should be subject to individual country reviews by the secretariat, and not merely a review of overall aggregate effect. The review should include a technical review of the communication, including the estimates in the emissions inventory, the transparency of the communication's conclusions, the consistency of the data, and the adherence to the reporting guidelines. (GCC)**

no statements which clearly support these positions. Instead, the emphasis seems to be on aggregate studies:

"Any other information that the Party considers relevant to the achievement of the objective of the Convention and suitable for inclusion in its communication, including, if feasible, material relevant for calculations of global emission trends."

- **The communications should specifically address actions taken and further opportunities for the JI process.**

The document is not specific. It seems to encourage national communications to contain "shopping lists" which may be used in a JI project.

"Parties may also present information on their specific needs and concerns arising from the adverse effects of climate change and/or the impact of the implementation of response measures" (page 5, Annex II).

"There is a clear need for adequate and additional financial resources, technical support and technology transfer to supplement the efforts toward capacity building for preparation of the national inventories" (page 6, Annex II).

"Developing country Parties may, in accordance with Article 12.4, on a voluntary basis, propose projects for financing, including specific technologies, materials, equipment, techniques or practices that would be needed to implement such projects, along with, if possible, an estimate of the incremental costs, of the reductions of emissions and increments of removals of greenhouse gases, as well as an estimate of the consequent benefits." (page 8, Annex II).

"Information on national technological needs related to measures to facilitate adequate adaptation to climate change may be included in the communication". (page 8, Annex II).

- **Communications should describe other actions that are being taken, in addition to JI, that would reduce greenhouse gas emissions. (GCC)**

"In accordance with Article 12.1, each Party not included in Annex I should communicate a general description of steps taken or envisaged by the Party to implement the Convention. Taking into account the chapeau of Article 4.1, the initial communication should seek to include, as appropriate:

(e) Programmes containing measures the Party believes contribute to addressing climate change and its adverse impacts, including the abatement of increase in greenhouse gas emissions and enhancement of removals by sinks". (page 7, Annex II).

- **The communication should make the best estimates it can of the future changes in greenhouse gas emissions expected to occur due to economic development or increased economic activity generally. It should estimate the reductions in greenhouse gas emissions that could occur due to joint implementation actions and other actions taken or planned to curb emissions. (GCC)**

There are no statements which support these positions.

References:

Annex I = Decisions to Promote the Effective Implementation of the Convention. Communications by Parties. Communications from Annex I Parties: Guidelines, Schedule and Process for Consideration. Document FCC/CP/1996/L.13/Add.1. 17 July 1996.

Annex II- Communications from Parties not included in Annex I: guidelines, facilitation and process for consideration. Document FCC/CP/1996/L.12. 17 July 1996.



9/9/96



# GLOBAL CLIMATE COALITION

SEP 5 1996

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## MEMORANDUM

**DATE:** September 3, 1996

**TO:** GCC Post Berlin Working Group Members

**FROM:** John Shlase *J. Shlase*

**SUBJECT:** Revised Discussion Paper on Technology Assessment by Bob Watson

As requested at the last meeting of the Post Berlin Working Group, we contacted Bob Watson regarding whether or not a revised draft had been prepared of the IPCC Discussion Paper on Technology Assessment.. Please find attached the revised version for your review. This paper will be discussed at the IPCC meetings in Mexico City next week.

**DISCUSSION PAPER  
IPCC TECHNOLOGY ASSESSMENT**

**R.T. Watson, M.C. Zinyowera and R.H. Moss**

This paper outlines the possible scope and approach that could be used by the IPCC to assess the technical and market potential of current and emerging (innovative) technologies to mitigate (decrease sources or enhance sinks) greenhouse gas emissions from all key sectors. The proposed scope of the assessment does not include the important issue of adaptation technologies, which should be considered as the topic of a separate assessment. In addition, this document does not discuss whether a new set of "non-climate intervention emission scenarios" needs to be generated as a workshop has already been scheduled to discuss this issue (London, September 24-26, 1996).

This scoping paper has been written by the co-chairs and technical support unit of Working Group II with input from a wide range of stakeholders. We solicited input from a number experts from governments, industry, universities, and environmental organizations from both developed and developing countries. An informal workshop was held during COP-2 to review the first draft of this paper.

**Objectives of the Assessment**

This assessment is intended to provide a credible, transparent and objective assessment of the technical and market potential of current and emerging technologies to mitigate greenhouse gas emissions in all regions of the world. Costs and time-frame for market penetration of competing technologies will be assessed.

**Audience for the Assessment**

This information will be designed to assist governments, industry and other private sector entities in determining what is the appropriate use of technologies and policies considering their particular economic and geographic circumstances and, in the case of governments, their commitments under the Framework Convention on Climate Change:

- **Convention Bodies:** (a) what opportunities exist to encourage common actions through coordinating, consultative, or information-sharing mechanisms; and (b) what range of reductions by sector are technically feasible, at what cost, and in what time frame, for the application of current and emerging technologies.
- **Governments:** (a) what technologies are currently available and likely to be available in the near- (next 10 years) and longer-term (greater than 10 years) that would be appropriate for countries, recognizing individual and regional circumstances; and (b) what are the opportunities and the barriers (including

public acceptability, sectoral and macro-economic policies) to the diffusion of current and emerging technologies into the market place, and what approaches can be used to overcome those barriers:

Resource Managers and Decision-makers: which projects, facilities or technologies offer investment opportunities, and the potential for cost-effective emissions reductions.

### **Participation**

While the preparation and review of the technology chapters of the SAR involved developed, developing, and transitional economy country experts from universities and government institutions there was inadequate involvement from experts from the private sector (finance and industry) and from development agencies. The substantive involvement of these stakeholders in technology assessments is critical to the reliability and acceptability of the assessments. Involvement of these stakeholders will add significantly in the area of practical experience, with respect to implementation of existing environmentally sound technologies that are underutilised, the development of new technologies, and the process of technological diffusion into the market place, i.e., how technologies evolve from the design phase (laboratory demonstration) into viable commercial activities.

From the very start of the IPCC process, it was recognized that the strength and credibility of the IPCC rests on inclusive representation of experts from developed and developing countries and from countries with economies in transition. Even though the first two comprehensive IPCC assessments involved significant representation from developing countries, a more concerted effort must be made in the next assessment to ensure greater and more appropriate representation of experts who understand the particular financial and institutional circumstances, and the challenges and opportunities, in developing countries and countries with economies in transition.

Therefore, experts and stakeholder groups (universities; government institutions; intergovernmental organizations; industry, industry associations, and other NGOs; financial institutions; environmental organizations and bilateral and multilateral development agencies) from all regions of the world who have experience in the development and application of current and emerging appropriate technologies in developed and developing countries and countries with economies in transition must be substantively involved. The expert teams should have open-ended, but balanced representation. If the teams become too large, an acceptable, transparent, method of selecting membership will have to be developed.

Each section of the report will have two convening lead authors, one from an Annex I country (developed or with an economy in transition) and one from a non-Annex I country (developing country). These convening lead authors will be responsible, in conjunction with the Bureau of the Working Group(s), with preparing the initial draft of the Summary for Policymakers.

## Principles

The IPCC procedures will govern the preparation and review of the proposed assessment of the technical and market potential of current and emerging technologies to mitigate greenhouse gas emissions. In particular:

- the scope and the timetable for the assessment will be approved by the IPCC;
- prior consultations with all key stakeholders to ensure transparency and equity will be held;
- experts will be drawn from the full range of geographical circumstances, i.e., developed and developing countries, and countries with economies in transition;
- experts will represent the full range of stakeholders, including university, government, environmental, industry, and financial sectors;
- participation of experts will be based on actual technical expertise, with industry and environmental NGO experts being identified from within their stakeholder groups, ensuring balanced representation of different competing interests;
- representation of technical and market experts;
- experts are independent and do not represent their organizations;
- full disclosure of potential conflicts of interests by all experts;
- cross-sector representation in the expert groups to ensure that cross-sectoral issues will be covered, thus avoiding inconsistencies among elements of the assessment;
- the assessment will evaluate the technical and market (including an assessment of costs) potential of all competing technologies, identifying opportunities and barriers to the widespread adoption of current and emerging technologies by geographic region, but will not pick winners and losers;
- recognize expert limitations for new or emerging technologies compared to existing technologies, in particular recognize that the performance of emerging technologies can be hard to evaluate and are sometimes only as good as "best expectations";
- uncertainties and differences of opinion that will remain through the process of preparing and reviewing this assessment will be clearly articulated;
- the IPCC peer-review process, which involves expert and government review, will be complemented by an editorial board of experts to ensure that review comments are appropriately considered by the lead authors. Sectoral Coverage  
The assessment needs to be comprehensive covering sources and sinks of all key greenhouse gases in all sectors, just as in the SAR, except those covered by the Montreal Protocol, which are assessed separately. Therefore, the sectors and sub-sectors to be covered will include, but not be limited to:
- Energy Supply and Transmission - fossil fuels (coal, oil and gas: including potential for increased power generation efficiency and fuel switching) - renewable energies (modern biomass, geothermal, hydropower, solar thermal, solar-electric, tidal, and wind) - nuclear (fission and fusion) - carbon sequestration and transmission efficiency



- **Energy Demand** - transportation - residential and commercial buildings - industry (all major small-, medium-, and large-scale industries including mining, petroleum, chemicals, metals, automotive, etc.) - utilities
  - **Land Management** - agriculture - forestry - rangelands
- Scope of Assessment for each Sector** The assessment will evaluate the technical and market potential of current (including traditional technologies in developing countries) and emerging technologies, by examining technologies, processes, practices and policies on a global, and to the degree possible, regional basis:
- description of the state of technology: (a) current (including traditional technologies in developing countries), with wide application; (b) current (promising) but not widely applied; and (c) emerging;
  - extent to which promising or emerging technologies have similar or dissimilar characteristics to current technologies with wide application (e.g., product quality, public acceptability, and safety);
  - institutional (including regulations and incentive structures) and technical barriers (including skill requirements for installation, operation and maintenance of new technologies, and whether existing infrastructure would be suitable for emerging technologies) to effective use of promising and emerging technologies;
  - impact of public and private sector R&D on technology pipeline;
  - approaches for market penetration, including the impact of policies on the rate of diffusion of technologies into the market place (such as market pull and demonstration programs, economic incentives during market build-up, performance-based standards and regulations, and other incentives such as accelerated depreciation), and the impact of indigenous knowledge and national and regional information centres;
  - obstacles to the acquisition of new technologies by developing countries and countries with economies in transition, and approaches to overcome them (including technology transfer);
  - current and projected capital, operating and maintenance costs of current and emerging technologies, and availability of financing;
  - macro-economic implications of changes in technologies, including effects on existing sectors and businesses, trade, and employment, recognizing the importance of avoiding the premature turnover of capital stock wherever possible;
  - interactions between different sectors and sub-sectors;
  - utility of existing and planned technology data-bases;
  - environmental implications of current and emerging technologies at the local- (e.g., urban air pollution), regional- (e.g., acid deposition) and global-scale (climate change due to the emissions of greenhouse gases): the key issue is the degree to which greenhouse gas emissions can be reduced.

### Structure of the Report

The report would consist of a series of sub-sector reports, which would then be synthesized into sector reports, each with an executive summary. There would then be a section, with its own executive summary, synthesizing the sector reports. e.g., assessing the

technical and market potential to attain different targets and timetables for greenhouse gas emissions. There would then be a Summary for Policymakers covering all aspects of the assessment.

### **Sources of Information**

Previous IPCC assessments have been primarily based on information in the peer-reviewed literature. The major challenge for the next IPCC technology assessment will be to incorporate non peer-reviewed, often proprietary, information that draws on practical experience of business, finance and environmental organizations. Therefore, the expert panels will use expert judgment to assess:

- peer-reviewed open-access literature;
- publications of organizations such as IEA and UNIDO;
- technology data bases;
- national communications;
- case-study information on the application of appropriate technologies; and
- technical and market material provided by suppliers and manufacturers.

At the beginning of the assessment there should be an open (public) solicitation for non-confidential information to ensure that experts that are unable to participate in the preparation of the assessment can have their information taken into consideration.

### **Timing**

There are a number of options that can be considered, ranging from a single comprehensive assessment covering all gases and all sectors (this approach is preferred by most industry reviewers of this draft document), to a pipeline (a sequence) of narrower more focused assessments. The assessments could start, subject to approval by the IPCC at its twelfth session (Mexico City, 11-13 September, 1996), in fall of this year. A comprehensive assessment would take about two and one half years and could be completed in early to mid-1999:

- six months to structure the assessment, and to identify, and obtain a commitment to participate, relevant experts from all regions of the world and all relevant stakeholder groups, and agree on procedures for using non-peer-reviewed information;
- twelve months to prepare the sub-sector and sector assessments;
- six months to integrate the sector reports into a holistic perspective of the potential of current and emerging technologies by region and with time; and
- six months to conduct the expert and government peer-review in accordance with IPCC procedures.

If a portfolio approach is preferred, then a comprehensive multi-year workplan would have to be developed that would demonstrate that all sectors and gases would be assessed in a methodical manner. This would also provide a schedule of when a particular expertise would be necessary.

7/19/96

ROBERT S. PALMER (R), Pennsylvania, Republican

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# U.S. HOUSE OF REPRESENTATIVES COMMITTEE ON SCIENCE

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September 3, 1996

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 \*Rep's Committee Member

The Honorable Warren M. Christopher  
 Secretary  
 U.S. Department of State  
 2201 C Street, NW  
 Washington, DC 20520

The Honorable John H. Gibbons  
 Assistant to the President for  
 Science and Technology and Director  
 Office of Science and Technology Policy  
 Executive Office of the President  
 Executive Office Building  
 Washington, DC 20500

Dear Secretary Christopher and Dr. Gibbons:

At its Eleventh Session in Rome in December, 1995, the Intergovernmental Panel on Climate Change (IPCC) decided to expand its portfolio of "products" beyond its full assessment reports (such as the 1995 Second Assessment Report) and its "special reports" (such as the 1994 report on "Radiative Forcing and An Evaluation of the IPCC IS92 Emission Scenarios"). The IPCC agreed on the need for a third kind of IPCC report referred to as "Technical Papers" and established procedures for their preparation. I am writing to both of you to share my concerns that the drafts of the first three Technical Papers that have recently come to my attention do not appear to conform to the new procedures specifically adopted by the IPCC in Rome - referenced as "Addendum 2 to the IPCC Procedures: IPCC Procedures for the Preparation of Technical Papers" (hereafter referred to as Addendum 2 Procedures).

It is my understanding that the impetus for the Technical Papers was a recognition that the established IPCC procedures for drafting, review, and acceptance of full assessments and special reports was time-consuming and that the IPCC was unable to respond in a timely manner to short-term requests for scientific, technical and other information and advice. Reportedly, the IPCC felt that there was a need to extract information from the assessment and special reports on particular issues for the Parties to the U.N. Framework Convention on Climate Change. Accordingly, the IPCC adopted by consensus in Rome Addendum 2 Procedures for Technical Papers that differ markedly from the established procedures for the preparation and the acceptance or approval of IPCC assessment and special reports.

Secretary Christopher and Dr. Gibbons  
September 3, 1996  
Page two

Under the Addendum 2 Procedures, the process and allowed time for review of Technical Papers by experts and governments is more limited, and, most importantly, the content or text of Technical Papers is "finalized by the lead authors, in consultation with the IPCC Bureau which functions in the role of an editorial board, based on the [review] comments received." This change itself is a significant departure from the established IPCC process, which has always reposed with the participating governments the final authority over the content and text of IPCC assessment and special reports. It is governments under the normal procedures for assessment and special reports, not lead authors or the IPCC Bureau, which possess the right to "accept" or "approve" the IPCC's assessment and special reports.

The Committee's understanding, which is based in part on the participation of our staff at the IPCC session in Rome, is that the primary, if not the sole, justification for deviating from the normal procedures in the case of Technical Papers is that such papers "are based on the material already in the IPCC assessment reports and special reports." (Emphasis supplied.) Indeed, this quote is the first of eight requirements in the Addendum 2 Procedures.

As you know from prior correspondence, the Committee is greatly concerned about the IPCC's strict adherence to its agreed procedures. Such adherence is necessary in order to assure the integrity of the IPCC process and its resulting reports, which are intended to be relied upon by policymakers and the public.

The drafts of three proposed Technical Papers are currently under review by governments and others, and it is my understanding that comments are due on Labor Day for two papers and on September 3 for the third. The three draft Technical Papers in question are clearly intended not only to inform, but also to influence and perhaps even to persuade, the international policymakers who participate in the current negotiations under the U.N. Framework Convention on Climate Change.

A preliminary review by Committee staff indicates that these draft Technical Papers set forth projections, analysis, and commentary that often appear to go well beyond those which were presented in previous assessment or special reports. They, therefore, appear not to conform to the first of eight Addendum 2 Procedures' requirements. As such, it would appear that such papers should be subject to the established procedures for assessment and special reports, and not the more limiting Addendum 2 Procedures.

Several examples of this departure from the first Addendum 2 Procedures' requirement are set forth in the Attachment. And I believe that, based on these few examples, there are at least serious questions that need to be addressed as to whether significant material fairly can be said to be "based on the material already in IPCC assessment reports and special reports." I would also expect that a more detailed review would reveal additional problems of this nature.

Addendum 2 Procedures require "simultaneous" review of the drafts by experts and governments, and that the drafts be "revised by the lead authors based upon comments" received from experts and governments. However, the Addendum 2 Procedures do not explain who decides whether the

Secretary Christopher and Dr. Gibbons  
September 3, 1996  
Page three

drafts conform fully to the first, and most important, the Addendum 2 Procedures' requirement that the drafts "are based on the material already in the IPCC assessment reports and special reports."

Given the importance of adhering to the IPCC Procedures to the continued integrity of the IPCC, I assume you would agree that a Technical Paper that contains material not "based on the material already in IPCC assessment reports and special reports" cannot be published by the IPCC. Indeed, given these concerns, it may be appropriate for the IPCC to reconsider and withdraw the Addendum 2 Procedures, and require that the preparation of Technical Papers follow the same procedures as those required for assessment and special reports. In any case, issues of conformity, such as those raised in the Attachment, concerning, for example, "extended and idealized protocols" that are analyzed in one of the Technical Papers and criteria for evaluation of policies and measures that are developed by the authors of another Technical Paper -- none of which previously have been "accepted" or "approved" under the normal IPCC procedures -- should be resolved by the participating governments, not lead authors.

If you disagree with my understanding of the Addendum 2 Procedures or with my contention that the drafts do not conform with those Procedures, I request your full explanation of that disagreement.

If, however, you in essence share my concerns about these three draft Technical Papers, I request that you make your views known to the IPCC, including, but not limited to, making them a part of the U.S. written comments to the Lead Authors and raising them to the IPCC at its Twelfth Session in Mexico City on September 11-13, 1996. It may be the only forum at which the U.S. delegation could take effective steps to assure that not only current drafts of the Technical Papers, but those to be developed in the future, conform to the Addendum 2 Procedures.

I note that the Annotated Provisional Agenda for the Mexico City IPCC meeting includes an item (4.2) regarding "[m]inor editorial amendments to the Principles Governing IPCC Work and the IPCC Procedures to bring the language in line with WMO/UN practice." Although the subject of the Addendum 2 Procedures is not specifically incorporated in the Annotated Provisional Agenda, I note that the Agenda states that it "may be amended at any time during the session" (1.3). There is no reason why the item (4.2) concerning amendments to the IPCC Procedures could not accommodate appropriate discussion and any necessary action to assure that Technical Papers actually conform to the Addendum 2 Procedures, or to abandon the concept of technical papers if such conformity cannot be assured.

I stress that these three draft Technical Papers are the first to follow the new Addendum 2 Procedures. And they will set important precedents that are likely to have significant consequences for governments and, in the case of the U.S., our economic, industrial competitiveness and job interests. Thus, satisfactory resolution of the conformity issue should be a U.S. priority.

Secretary Christopher and Dr. Gibbons  
September 3, 1996  
Page four

I request your response to these concerns prior to the Mexico City meeting of the IPCC. And finally, I also request that you forward to the Committee copies of all Federal agency comments on these three Technical Papers, as well as a copy of the official U.S. submission of comments on these Technical Papers to the IPCC.

Cordially,



Robert S. Walker  
Chairman

RSW:hjw

Attachment

cc Secretary of Energy O'Leary  
Secretary of Commerce Kantor  
EPA Administrator Browner  
Dr. Bert Bolin  
Sir John Houghton  
Dr. L. Gylan Meira Filho  
Dr. Robert T. Watson  
Dr. M.C. Zinyowera  
Mr. J.P. Bruce  
Dr. Hoesung Lee

## ATTACHMENT (Page 1 of 4)

### Examples of Apparent Departures from Addendum 2 Procedures for IPCC Draft Technical Papers

#### General Comment

Our staff review notes that the draft Technical Papers make many statements or conclusions that are presumably intended to be based on the 1995 Second Assessment Report or earlier reports. However, they often fail to give any citations or cross references to the portion or portions of the assessment or special reports relied upon by the lead authors. The problem is compounded when, as frequently is the case, the reference cited to support a statement in the Technical Paper is non-IPCC literature. That is not helpful to the reviewers and, most importantly, it gives rise to questions about the origin of such statements and conclusions. It suggests that the Technical Papers may incorporate new material that was never considered by experts and governments in Rome or earlier under the established IPCC procedures.

#### Working Group I Technical Paper 2: "Stabilisation of Greenhouse Gas Concentrations in the Atmosphere"

(1) Section 5 concerns "Equivalent CO<sub>2</sub> Temperature, and Sea Level Consequences of Stabilisation of CO<sub>2</sub> Concentrations." On pages 13 (lines 19 and 39) and 14 (lines 1-6) of Subsection 5.1, "Experimental Design for Temperature and Sea Level Analyses," it is stated:

"... We have developed an experimental design . . . We employ, as our primary climate model, that of Wigley and Raper (1992), as updated in Kattenberg *et al* (1996) and in Raper *et al* (1996) (to include differential land/ocean sensitivity and variable upwelling rate), and further updated for the current exercise (details given in TP [Technical Paper] 1). For global-mean temperature calculations, we also use models of similar structure from Harvey, Jain and Jos and the 2D model of de Wolde (Harvey, 1988; Jain *et al*, 1994, 1995; Siegenthaler and Joos, 1992; de Wolde *et al*, 1995) (results from models other than Wigley/Raper are incomplete at this stage, but will be included in the final version)."

Note that Technical Paper I has not yet been distributed – and, in fact is not yet scheduled for completion until February 1997, according to the IPCC's transmittal letter accompanying the Technical Papers under current review. It is difficult to understand how an analysis resulting from "an experimental design," employing a "further updated" climate model (the details of which are not disclosed), and reflecting results from other models that "are incomplete at this stage" can fairly be said to be "based on the material already in the IPCC assessment reports and special reports," as required by the Addendum 2 Procedures.

(2) On page 15, lines 22-25, it is stated:

"Note that the results reflect a choice of climate sensitivity and were computed using simple climate models. As discussed in TP [Technical Paper] 1, these models are designed to reproduce with reasonable fidelity the globally-averaged behavior of complex models, and have also been compared to historical and/or present day observations."

## ATTACHMENT (Page 2 of 4)

As noted in (1) above, Technical Paper 1 has not yet been distributed -- and, in fact is not yet scheduled for completion until February 1997, according to the IPCC's transmittal letter accompanying the Technical Papers under current review. Once again, it is difficult to understand how these results can fairly be said to be "based on the material already in the IPCC assessment reports and special reports," as required by the Addendum 2 Procedures.

(3) According to the text on page 39 (lines 9-11), Figure 23 "shows the constraint on Annex 1 emissions, if non-Annex 1 emissions continue to grow as projected in IPCC IS92a. Such a scenario would inevitably require rapid reductions in emissions in industrialised countries."

To our knowledge, this analysis has not appeared in any prior IPCC report. Figure 23 would appear to presuppose that if the international community did agree to stabilize atmospheric carbon dioxide concentrations at 450 or 550 ppmv, the agreement would continue to exempt non-Annex 1 countries from emission limitation requirements (that would force their emissions below those projected in the IS92a scenario) for as many as 54 years from now. It is our understanding that the IS92 scenarios do not assume that the Annex 1 countries will be willing to undertake emissions limitation or reduction commitments while continuing to let non-Annex 1 countries "off the hook" for such a long time. Therefore, as nearly as we can determine from "material already in the IPCC assessment reports and special reports," there is nothing in them on which to "base" this portrayal of an emissions path for Annex 1 countries.

### Working Group I Technical Paper 3: "Temperature and Sea Level Implications of Proposed CO<sub>2</sub> Emissions Limitations"

(1) Technical Paper 3 seeks to evaluate various proposals for protocols to the U.N. Framework Convention on Climate Change (UNFCCC) that bear little resemblance to the protocols that have been discussed in the international negotiations under the UNFCCC. Indeed, the Technical Paper describes the subjects of its analysis as "extended and idealized protocols" (page 3, line 10) which, as far as we can tell, were never analyzed in the 1995 or prior IPCC reports.

- None of the protocol proposals that actually have been made in the international negotiations define or address the nature or extent of commitments concerning emissions limitations beyond 2100. Nevertheless, the "set of four extended and idealized protocols" assume what the Annex 1 countries' emissions will be through the entire study period, ending in 2100 (page 3, lines 15-21). There is no material in any IPCC report of which we are aware to support the reasonableness of an assumption, that, after returning their emissions to 1990 levels in 2000, the Annex 1 countries thereafter would reduce them during the 21st century at annual compound rates of 0.5% or 1.0% per year, or that, after reducing their emissions 20% below 1990 levels during the period 2000-2005, they would reduce emissions further during the period ending 2100 at an annual compound rate of 1.0%. Yet the Technical Paper appears to make that assumption.



## ATTACHMENT (Page 3 of 4)

- All of the protocol proposals that actually have been made in the international negotiations refer to anthropogenic emissions of greenhouse gases, and none would confine commitments to fossil-fuel carbon dioxide emissions. Yet, the Technical Paper's analysis seeks to determine the global-mean temperature and sea level consequences of limitations *only* on fossil-fuel carbon dioxide emissions.

We note that such an approach, rather than being "based on" IPCC reports, is inconsistent with some of the more important information in the Second Assessment Report. As stated at page 40 in the "Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change" (1995), "the other greenhouse gases contribute significantly (about 30%) to the projected global warming."

The temperature and sea level projections set forth in the Working Group I Summary for Policymakers and in the IPCC's Synthesis Report take into account all greenhouse gases, not merely carbon dioxide emissions from fossil fuels.

- The analyses of the "set of four extended and idealized protocols" appear to have assumed that global SO<sub>2</sub> emissions remained constant at their 1990 level through 2100 (page 4, line 22), even though fossil fuel emissions from non-Annex I countries are expected to rise markedly during that period under all of the IS92 emission scenarios (Table 1, page 13). The Second Assessment Report (including the Working Group I Summary for Policymakers and the Synthesis Report) presented projections of temperature increase and sea level rise on the basis of the IS92 emissions scenarios for aerosol precursors (including SO<sub>2</sub> emissions). We understand that the only use of projections that assumed constant 1990 emission of aerosols - which were not included in either the Synthesis Report or the Summary for Policymakers - was "[t]o allow closer comparison with the projections presented in [the 1990 and 1992 IPCC reports] and to illustrate the sensitivity of future global temperature to changes in aerosol concentration. . . ." ("Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change" (1995), page 40). It is difficult to understand how projections in the draft Technical Paper, which fail to reflect increasing global SO<sub>2</sub> emissions, can be thought to be "based on the material already in the IPCC assessment reports and special reports."

(2) References are made to Technical Paper 1 (page 8, line 7; page 9, line 31), and indeed, it appears that analyses of various emission scenarios relies on calculations using the same models as employed in Working Group I, Technical Paper 2 (page 8, lines 5-13). Therefore, the comments noted on page 1 above apply - namely: (1) that Technical Paper 1 has not yet been distributed - and, in fact is not yet scheduled for completion until February 1997; and (2) that is

## ATTACHMENT (Page 4 of 4)

difficult to understand how an analysis resulting from "an experimental design," employing a "further updated" climate model (the details of which are not disclosed), and reflecting results from other models that "are incomplete at this stage" can fairly be said to be "based on the material already in the IPCC assessment reports and special reports," as required by the Addendum 2 Procedures.

### Working Group II Technical Paper: "Policies and Measures for Mitigating Climate Change"

For this Technical Paper, "the authors developed a set of criteria for analyzing policies and measures" (page 9, lines 49-50). And "[i]n preparing this analysis, the authors draw on materials used to prepare the Second Assessment Report and previous IPCC assessments and reports; they also draw on their own expert judgment to amplify and explain information from these sources" (page 9, lines 4-7).

It is our understanding that the IPCC has never developed such criteria in its prior reports. Furthermore, to draw on underlying materials that were used to prepare prior IPCC reports is not the same thing as basing a Technical Paper "on material already in the IPCC assessment reports and special reports." And to amplify the underlying source material with information not in prior IPCC reports, based on the judgment of the authors of the Technical Paper, would seem to go well beyond what is permitted under the agreed procedures for preparation of Technical Papers.

### Concluding General Comment

As a final note, we presume that there would be no objection for the IPCC to conduct analyses of the issues that are the subject of these three Technical Papers, provided these analyses are subjected to the normal IPCC preparation, review, and approval or acceptance procedures. The information that could result from such analyses would likely be informative, assuming that the assumptions and methodologies used in the analyses are sound. However, the potential for disagreements about such matters, coupled with the potential importance of the outcome of the analyses for the purpose of ongoing international negotiations, persuades us that such analyses should be presented in "Special Reports" that have been subjected to the normal, more rigorous IPCC established procedures.

Post-it® Fax Note	7671	Date	Sept 19	# of pages	13
To	Vinrus Machunas	From	GCC		

Attachment 11

September 17, 1996

Committee on Energy and Natural Resources: United States Senate  
**UNCERTAINTIES IN CLIMATE MODELING: SOLAR VARIABILITY  
 AND OTHER FACTORS**  
 Sallie Baliunas, Ph.D.  
 Senior Scientist, George C. Marshall Institute

*The test of all knowledge is experiment. Experiment is the sole judge of scientific truth.*  
 Prof. Richard Feynman, 1963, *The Feynman Lectures on Physics*

The possible outcomes resulting from the predicted rapid and dramatic rise in global temperature deserve serious thought. What are the scientific facts in support of the claim that human-made global warming will be significant (i.e., larger than the natural fluctuations of climate) and even possibly catastrophic? How is it known that computer simulations of the climate, forecast 100 years into the future, are accurate?

One starts by testing the computer simulations against the record of temperature change of the last 100 years. In the last 100 years, the global average surface temperature of the earth has risen about 0.5 C. Also during that interval the concentration of anthropogenic greenhouse gases has increased in the atmosphere. The increase in concentration is roughly equivalent to a 50% buildup in carbon dioxide alone. That substantial buildup gives a way to test the computer simulations of climate change due to greenhouse gases from human actions. That is, by studying the temperature response to the 50% increase over the last 100 years the computer simulations can be tested against the actual response of the climate.

The computer simulations say that the global temperature should have risen in the last 100 years by roughly 0.5 - 1.5 C (aerosols, whose theoretical effect is included in that range, will be discussed below). While the magnitude of the rise, as post-predicted by the computer simulations, seems to agree with the observed temperature rise of 0.5 C, it is inconsistent with the *timing* of the warming.

The record of global temperature (Chart 1) shows that most of the warming of the last 100 years occurred before 1940. But most of the anthropogenic greenhouse gases entered the atmosphere after 1940. Human-made greenhouse gases cannot cause a warming that took place before they existed in the atmosphere. Therefore, most of the 0.5 C rise must be natural. Only a small part of the 0.5 C rise — no more than a few tenths degree — could have been caused by human-made greenhouse gases. In other words, the 0.5 - 1.5 C warming predicted by the computer simulations is exaggerates the greenhouse effect produced by the equivalent 50% buildup of carbon dioxide.

## The solar influence

If the anthropogenic greenhouse gases did not cause most of the warming early in the century, then what did? One possibility is that the total energy output of the sun changes, thereby causing some warming and cooling. The evidence for this is in two parts: *first*, the sun has been observed by NASA satellites to vary in total energy output in step with the 11-year sunspot cycle of magnetic changes in the sun. Although the satellite records only began in the late 1970s, which is too short a time to obtain information on century-long climate variations, the association of brightness changes with surface magnetic changes allows us to obtain information on the sun's brightness changes going back several centuries, because records of the sun's magnetism are available over that long period.

The length of the sunspot cycle is a particularly interesting proxy for changes in the sun's brightness. Chart 2 compares the sunspot cycle length with surface temperatures going back to 1750<sup>1</sup>. The correlation is nearly perfect.

The *second* part of the evidence for a solar influence on the climate is as follows. The sun's magnetic record can be converted to estimated brightness changes, using data from the sun and other sunlike stars, and input to a climate simulation. The results for the sun's changes are shown in Chart 3 for the years 1880-1993<sup>2</sup>. If the sun has changed brightness in the way the magnetic records have indicated, then changes in sun explain more than half of the variance of the temperature record from 1880-1993. The results for the sun suggest that its brightness changes have had a significant impact on climate change. A brighter sun may be the explanation for a substantial part of, and possibly most of, the 0.5 C global warming observed in the last 100 years.

## Aerosols

Pollutants such as sulfur dioxide complicate predictions of global climate change. Aerosols form a haze that absorbs or reflects sunlight causing a cooling that offsets some of the predicted greenhouse warming. Aerosols may also alter cloud properties.

Studies<sup>3,4</sup> of the response of climate change to aerosols are based on computer simulations. The theoretical effect of aerosols has been to cool the climate forecasts (Chart 4)<sup>3</sup>, both for the present and the future, and bring the

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<sup>1</sup> S. Baliunas and W. Soon, 1995, *Astrophysical J.*, 450, 896.

<sup>2</sup> W. Soon, E. Posmentier and S. Baliunas, 1996, *Astrophysical J.*, in press, December 1.

<sup>3</sup> J.F.B. Mitchell et al. 1995, *Nature*, 376, 50.

<sup>4</sup> B.D. Santer et al. 1995, *Climate Dyn.*, 12, 79. 1996, *Nature*, 382, 39.

computer forecasts more in line with the recent global temperatures. (However, allowing for the theoretical *cooling* effect of aerosols cannot explain the observed *warming* prior to 1940.) The modeled effect of aerosols does not change the conclusion that the computer simulations of climate are greatly exaggerating the size of the greenhouse warming.

*Regional results and the "fingerprint" studies* – "Pattern" studies<sup>3,4</sup> of anthropogenic greenhouse gases with the added effect of aerosols are considered in ensemble, region by region, and with height. They form the basis for the claim that the anthropogenic effect on climate has been detected<sup>5</sup>. But checking the forecasts in specific regions shows instead that the simulations fail to agree with observations. For example, two regions where the aerosol effect should be verified are heavily-industrialized Europe and North America (Chart 4)<sup>3</sup>. There the aerosol effect *worsens* agreement of the computer simulations with the temperature observations.

Moreover, the combined greenhouse plus aerosol model can be tested with data from the region where the computer simulations predict the most warming, namely the troposphere over the southern oceans<sup>6</sup>. That test (Chart 5) shows no net rise in temperature from 1958 to the present.

#### Satellite temperature measurements

NOAA satellites have been measuring the temperature at a height of a few kilometers in the atmosphere essentially over the entire earth since 1979.<sup>7</sup> These records have smaller systematic errors than the surface records, which, unlike the satellite records, come from a variety of instruments, techniques and measurement histories, and whose coverage is sparse over large areas like the southern ocean. The very precise satellite record shows no net warming over the last 17 years – contrary to the forecasts calculating the effect of the recent rapid increase in human-made greenhouse gases.

#### Temperature in the Arctic

Most computer simulations also post-predict a major, rapid warming in the Arctic, especially in the winter. The temperature record in the Arctic is thus a very sensitive test of the computer simulations. But over the last 50 years no net warming of the surface has been observed. The simulations also post-predict that

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<sup>5</sup> "Increasing confidence in the identification of a human-induced effect on climate comes primarily from such pattern-based work." (IPCC, 1996, p. 37, Sec. E.4).

<sup>6</sup> P.J. Michaels, P.C. Knappenberger, R.E. Davis and D. Legales, 1996, submitted to AGU Fall 1996 meeting. The most rapid warming is predicted for 30-60° S latitude, at a pressure height of 850-300 mb.

<sup>7</sup> J.R. Christy, 1992, *Global Climate Change: Implications, Challenges and Mitigation Measures*, ed. S.K. Majumdar et al. (Pennsylvania Acad. Sci.), p. 165; J.R. Christy 1995, *Climatic Change*, 31, 455.

the Arctic should have warmed by a degree or so in the last 17 years, the period during which satellites have made precise readings of the Arctic. Over the periods under study, the average temperature of the Arctic has not warmed. In the test of the Arctic records the computer forecasts exaggerate, by a very large amount, the warming that should have occurred.

### Error budget and uncertainties in the computer simulations

Apart from the possible uncertainty of a significant solar variability effect in global climate change, there are other major uncertainties in the computer simulations. These uncertainties are demonstrated by the fact that simulations of the present-day climate differ from one another by 5 C in the tropics (and nearly 20 C in the polar regions).<sup>8</sup>

*Water vapor feedback* – The computer simulations rely on water vapor, responsible for most of the natural greenhouse effect, to amplify the small warming directly resulting from the increase in carbon dioxide and other minor greenhouse gases.<sup>9</sup>

However, this assumption has been challenged.<sup>10</sup> After considering the water vapor feedback, Lindzen gives a preliminary estimate of 0.3 C for the global temperature response of an effective doubling of carbon dioxide (without any offsetting cooling by aerosols considered). Without a substantial, positive water vapor feedback, other feedback mechanisms are much less effective in amplifying the effect of increases in the minor greenhouse gases.

*Magnitude of other uncertainties* – Chart 6<sup>11</sup> shows some of the uncertainties in the climate simulations. Compared to the 4 W m<sup>-2</sup> radiative input to the atmosphere for an effective doubling of the concentration of carbon dioxide, the uncertainty in the effect of humidity alone is about 20 W m<sup>-2</sup>. An additional uncertainty of roughly 25 W m<sup>-2</sup> stems from calculating the heat flow from the equator to the polar regions<sup>12</sup>. This gives rise, finally, to area-by-area “flux adjustments” of up 100 W m<sup>-2</sup> in some areas of the coupled ocean-

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<sup>8</sup> IPCC, 1996, Sec.5.2.3.1

<sup>9</sup> “This feedback operates in all the climate models used in global warming and other studies.” IPCC, p. 200, 4.2.1. However, note: “[I]ntuitive arguments for [the feedback] to apply to water vapour in the upper troposphere are weak; observational analyses and process studies are needed to establish its existence and strength there.” (p. 200, 4.2.1). Also: “Feedback from the redistribution of water vapour remains a substantial uncertainty in climate models.” (p. 201)

<sup>10</sup> R. S. Lindzen, 1994, *Ann. Rev. Fluid Mech*, 26, 353; NAS R. Revelle Memorial Volume, 1966, in press.

<sup>11</sup> Adapted from R. Lindzen, private communication.

<sup>12</sup> “...[W]ithout knowing the dynamical heat fluxes, it is clear...that one cannot even calculate the mean temperature of the earth.” (Lindzen 1996, ref. 10)

atmosphere simulations. (Additional uncertainties in cloud physics are not discussed here).

### Summary

No evidence can be found in the observations of the global temperature for a dangerous warming derived from human actions.

The computer simulations of climate, which estimate a warming of roughly 1 C over the last 100 years, have overestimated the warming that has actually occurred by a factor of three or more. The same computer simulations projecting for the next 100 years (the time frame cited for the equivalent of a doubling of carbon dioxide) must be corrected for these overestimates of past warming. When corrected, the forecasted warming for the next 100 years is a few tenths C. That warming, spread over a century, will be negligible compared to the natural fluctuations in climate.

Furthermore, delaying the onset of drastic emission reductions by as much as 25 years results in a penalty of only 0.2 C in added temperature by 2100<sup>13</sup>, according to the current computer forecasts which are known to be exaggerating the warming. Investing in and waiting for better climate science would be appropriate, considering that the IPCC-forecasted warming has dropped by nearly a factor of two just in the last six years.

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<sup>13</sup> T.M.L. Wigley et al. 1996, *Nature*, 379, 240.

## Figure Captions

*Figure 1* – Comparison of the annual (light line) and smoothed (heavy line) global average surface temperature anomaly (GISS record), satellite record (medium-weight line, NOAA) and changes in temperature computed from a climate model (dotted line, Ref. 3) for greenhouse gases plus aerosols.

*Figure 2* – Yearly mean terrestrial Northern Hemisphere temperature anomaly (dotted line; smoothed with an 11-year moving average filter to emphasize long-term variations), compared with the length of the sun's magnetic polarity cycle (from Ref. 1).

*Figure 3* – Changes in global average temperature computed from a climate model for estimates of greenhouse gas forcing alone (smooth dotted line), solar forcing alone (dotted curve), and both greenhouse and solar forcing combined (dashed line) compared to the observed temperature anomaly (solid line). The amount of explained variance of the temperature record in each case is listed. (from Ref. 2).

*Figure 4* – Changes in the average temperature computed from a climate model assuming greenhouse gases only (dot-dashed line) and greenhouse gases plus aerosols (dashed line), compared with the observed temperatures for three records: global, North America and Europe (from Ref. 3).

*Figure 5* – Changes in temperature for latitude 30 - 60° S, at a pressure height of 850-300 mb, where greenhouse plus aerosol models predict the largest warming. The warming trend (solid line) previously reported (Ref. 4, 1996) applies only to the shorter record enclosed by the ellipse; a more complete and current temperature record shows no net warming (from Ref. 6).

*Figure 6* – Several uncertainties in climate change models compared to the radiative forcing of the effective doubling of carbon dioxide (from Ref. 11).

## Additional figure not discussed in text

*Figure 7* – Comparison of global satellite (NOAA), and surface (GISS, UKMO) records.



# GLOBAL TEMPERATURE

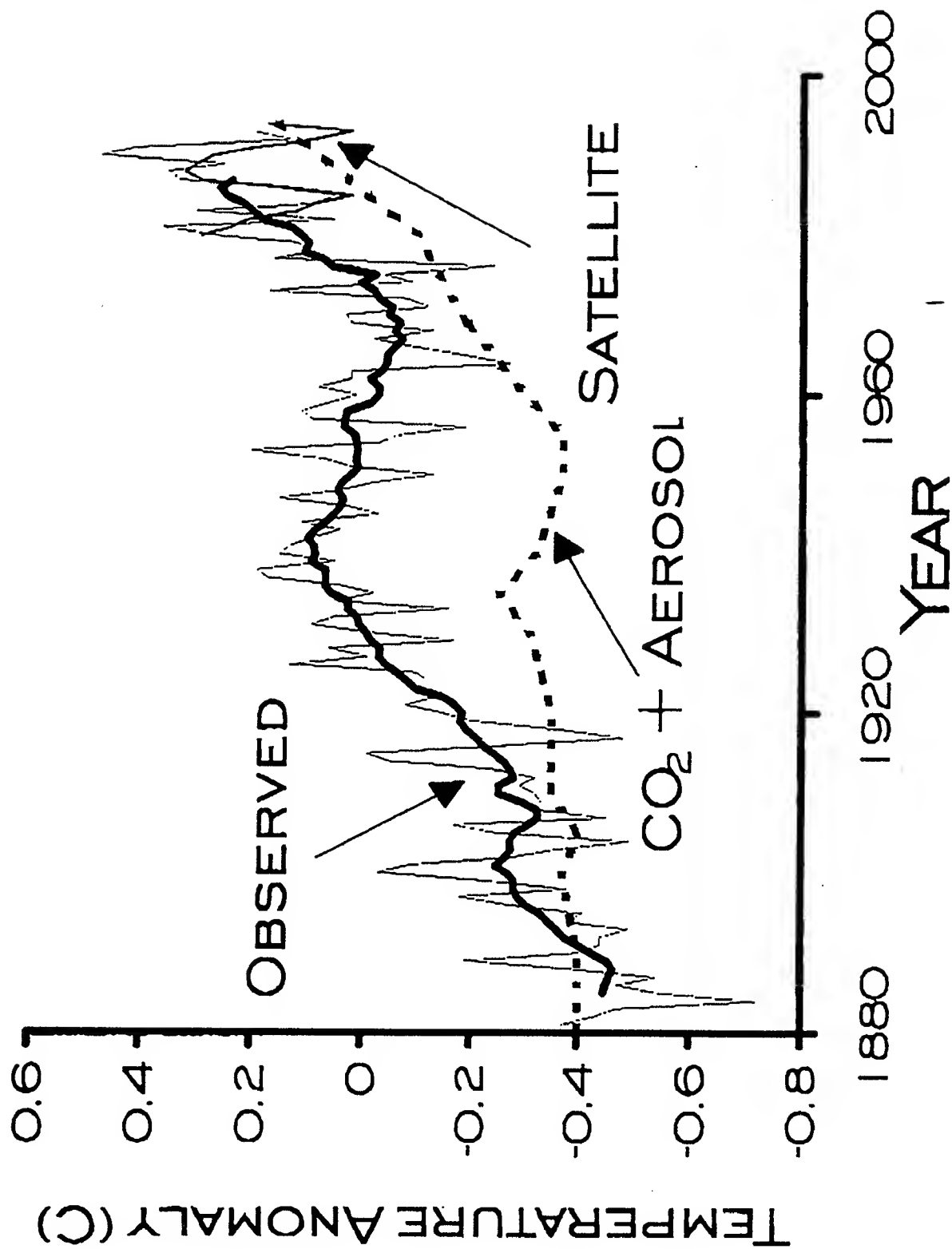


FIGURE 1

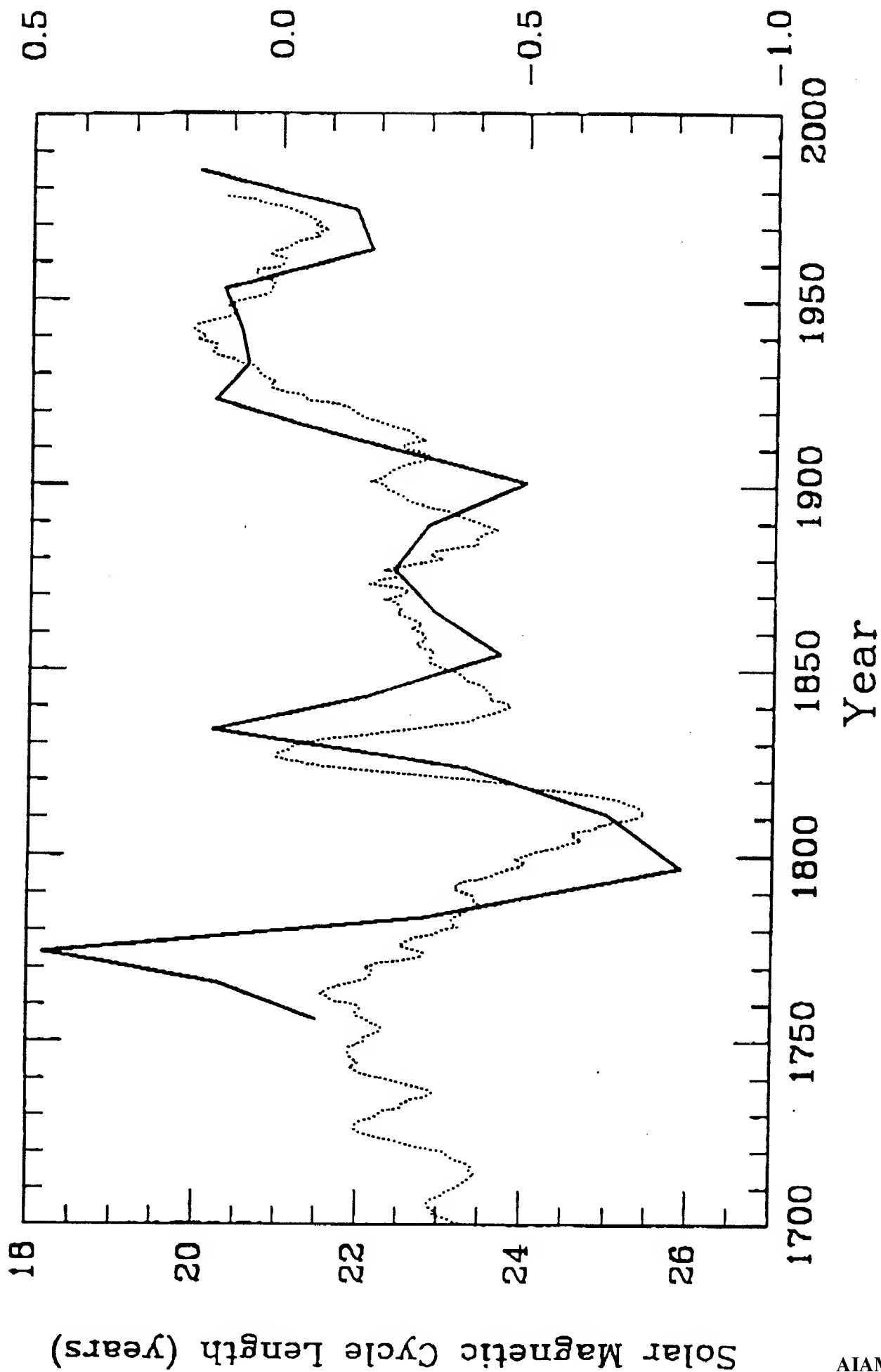


FIGURE 2

Least-Squares Fit of the Observed and Simulated Global Temperature Change (1885-1987)

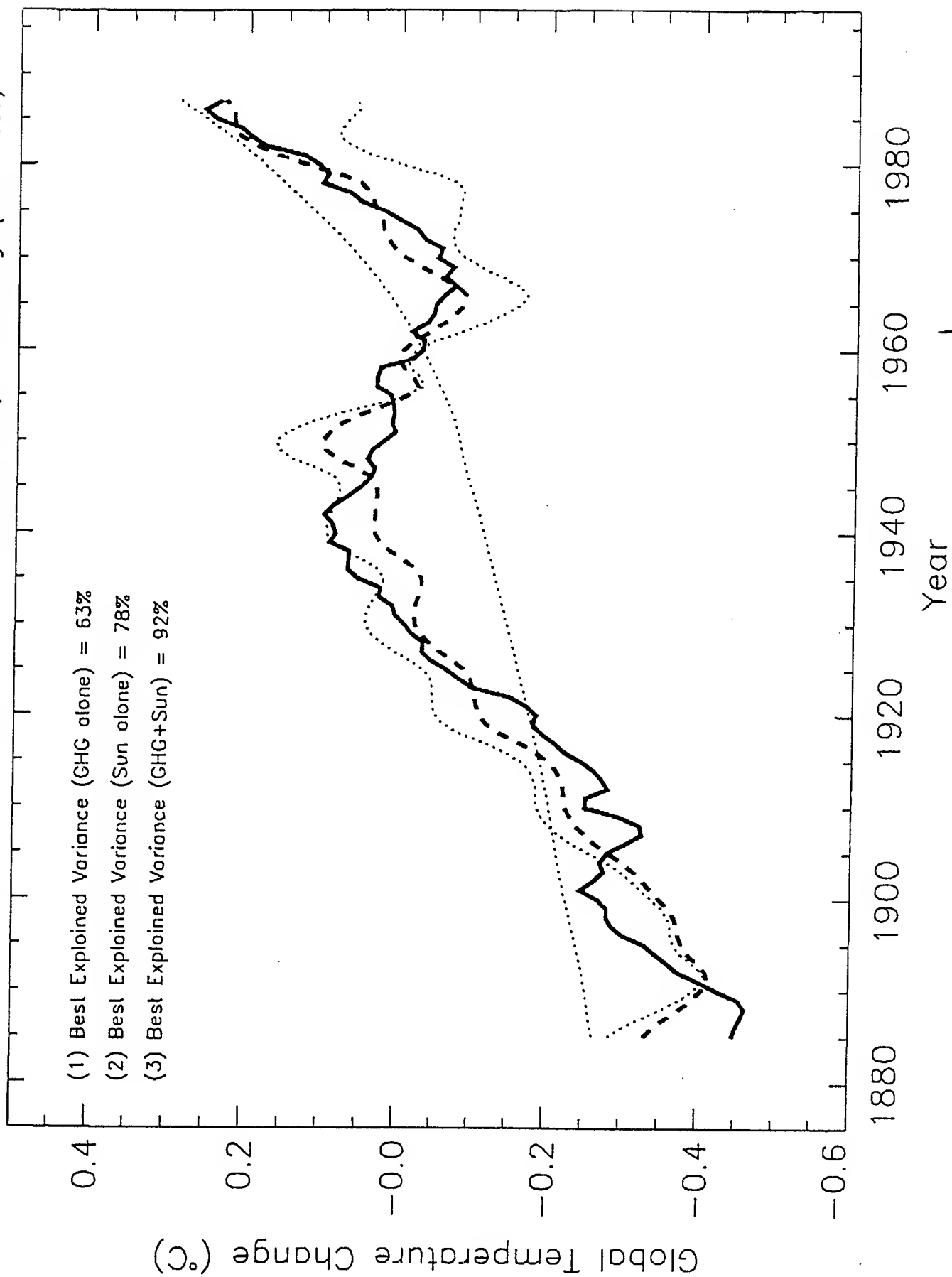
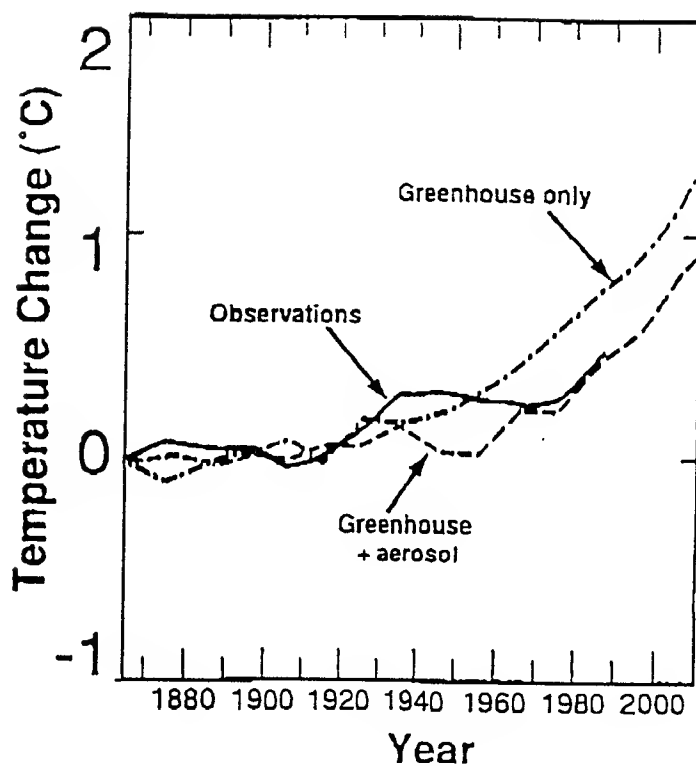
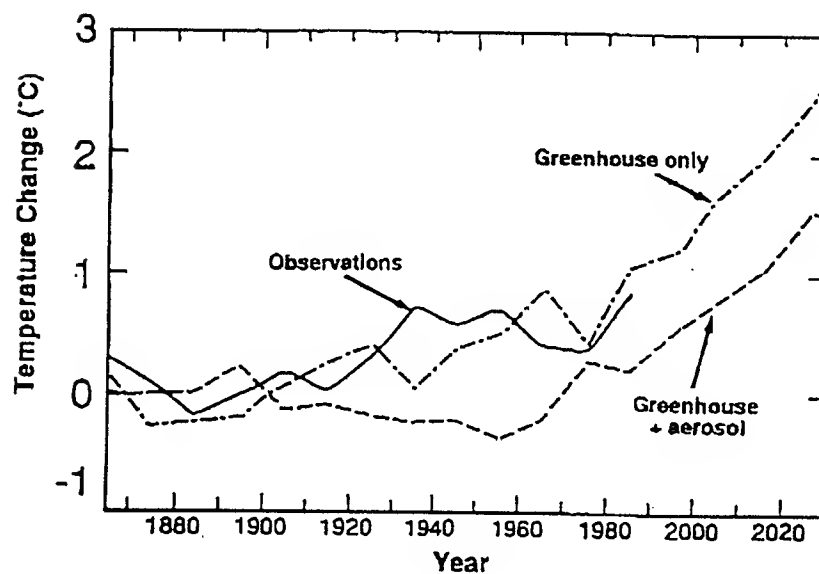
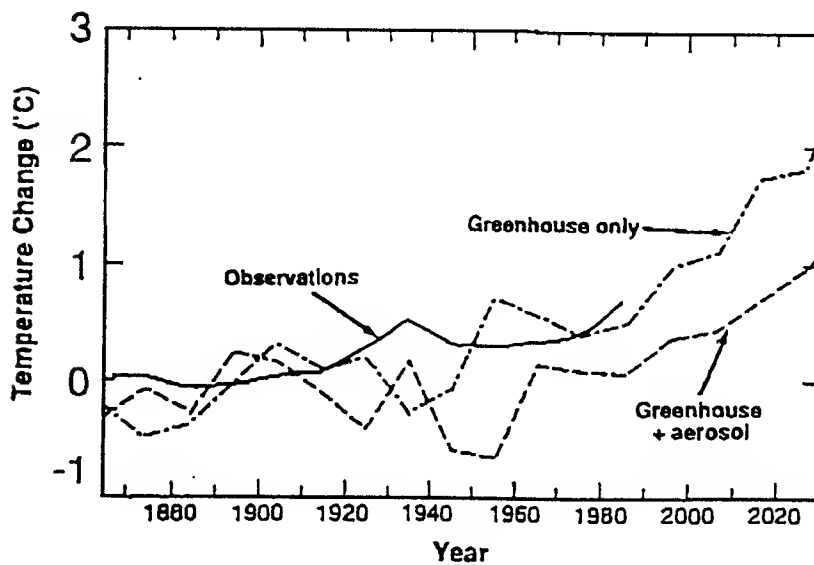


FIGURE 3



GLOBAL

NORTH  
AMERICA

EUROPE

FIGURE 4

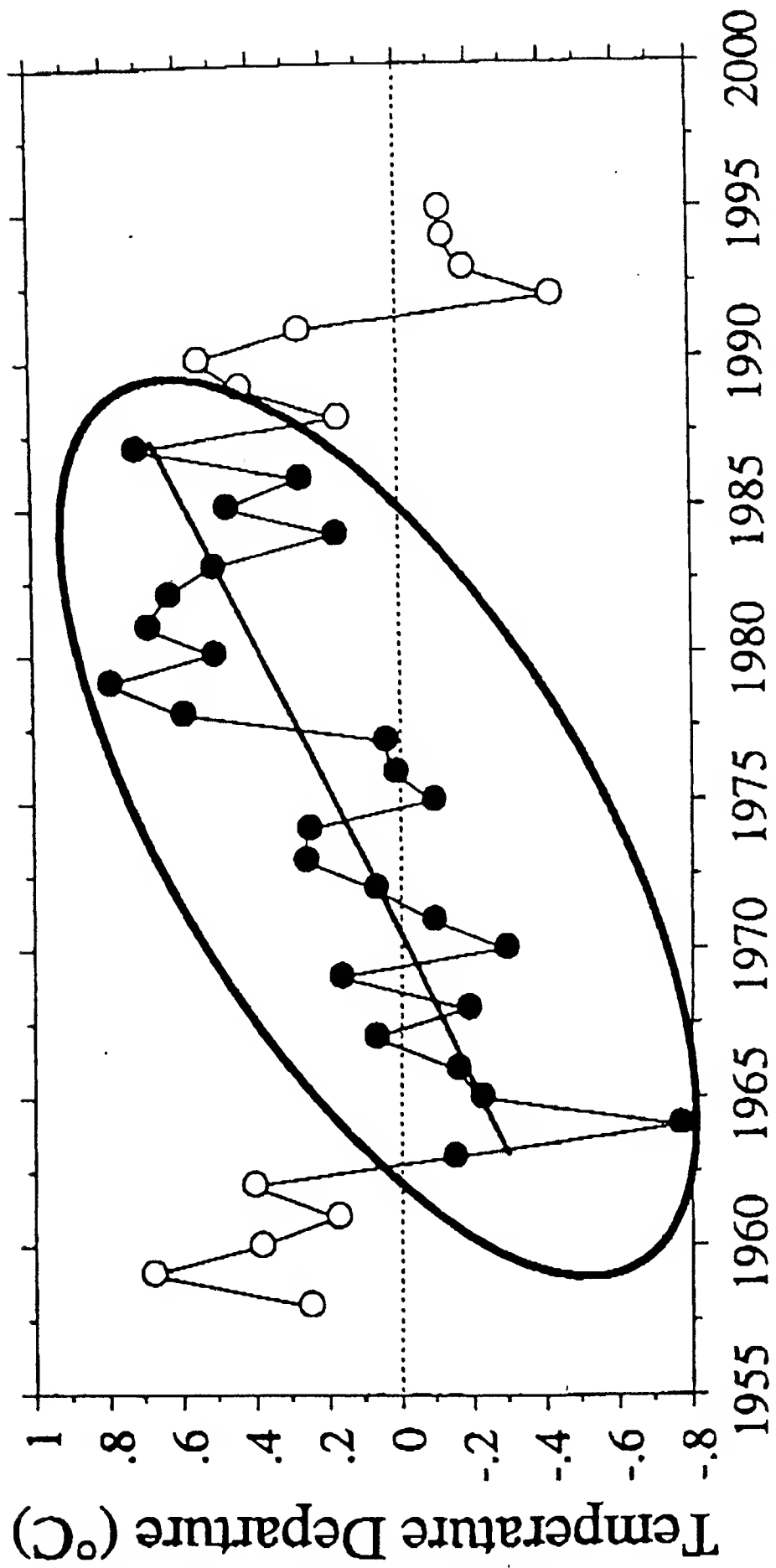


FIGURE 5

# UNCERTAINTIES IN CLIMATE CHANGE MODELS COMPARED TO GREENHOUSE FORCING

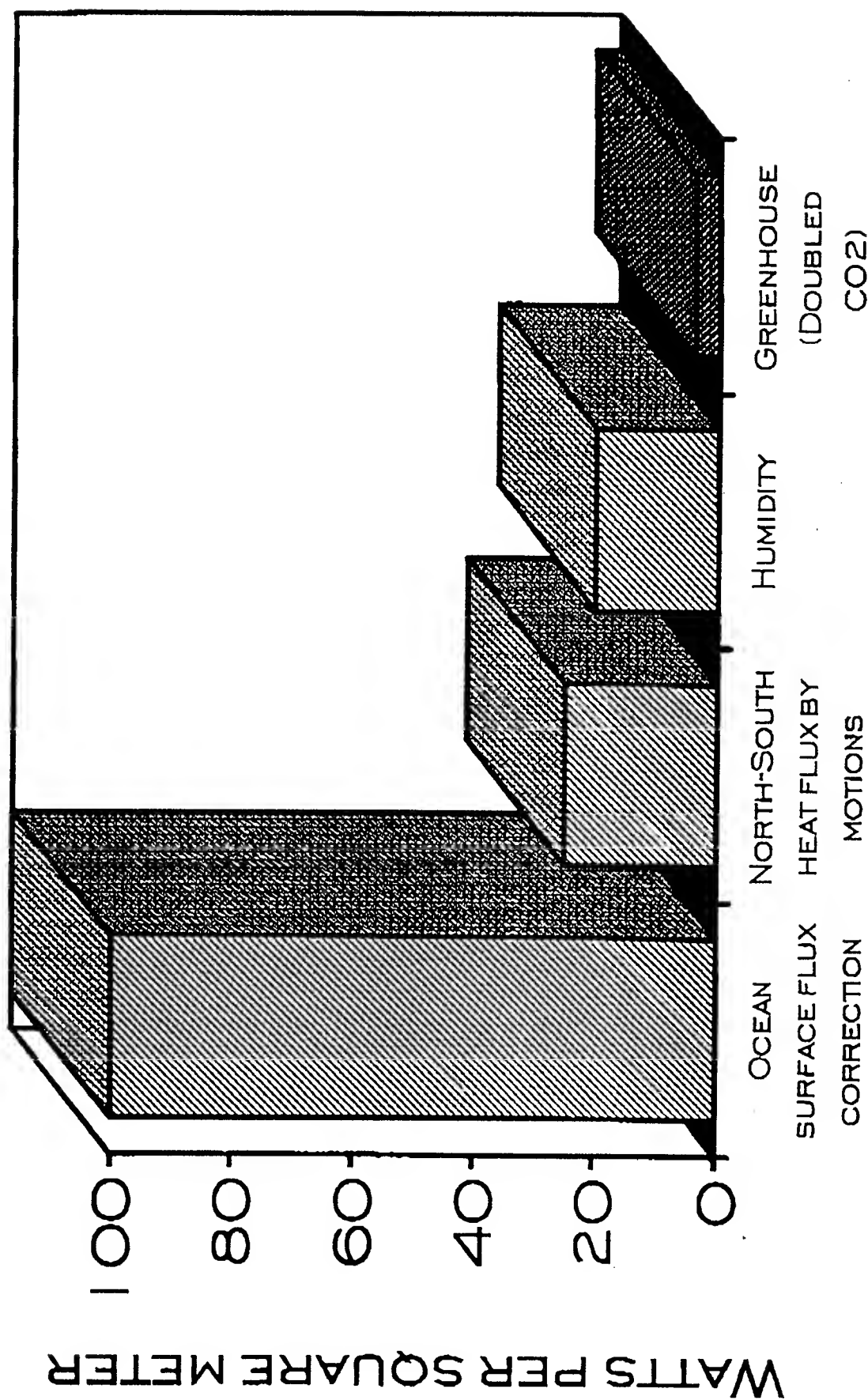


FIGURE 6

# GLOBAL TEMPERATURE SURFACE AND SATELLITE

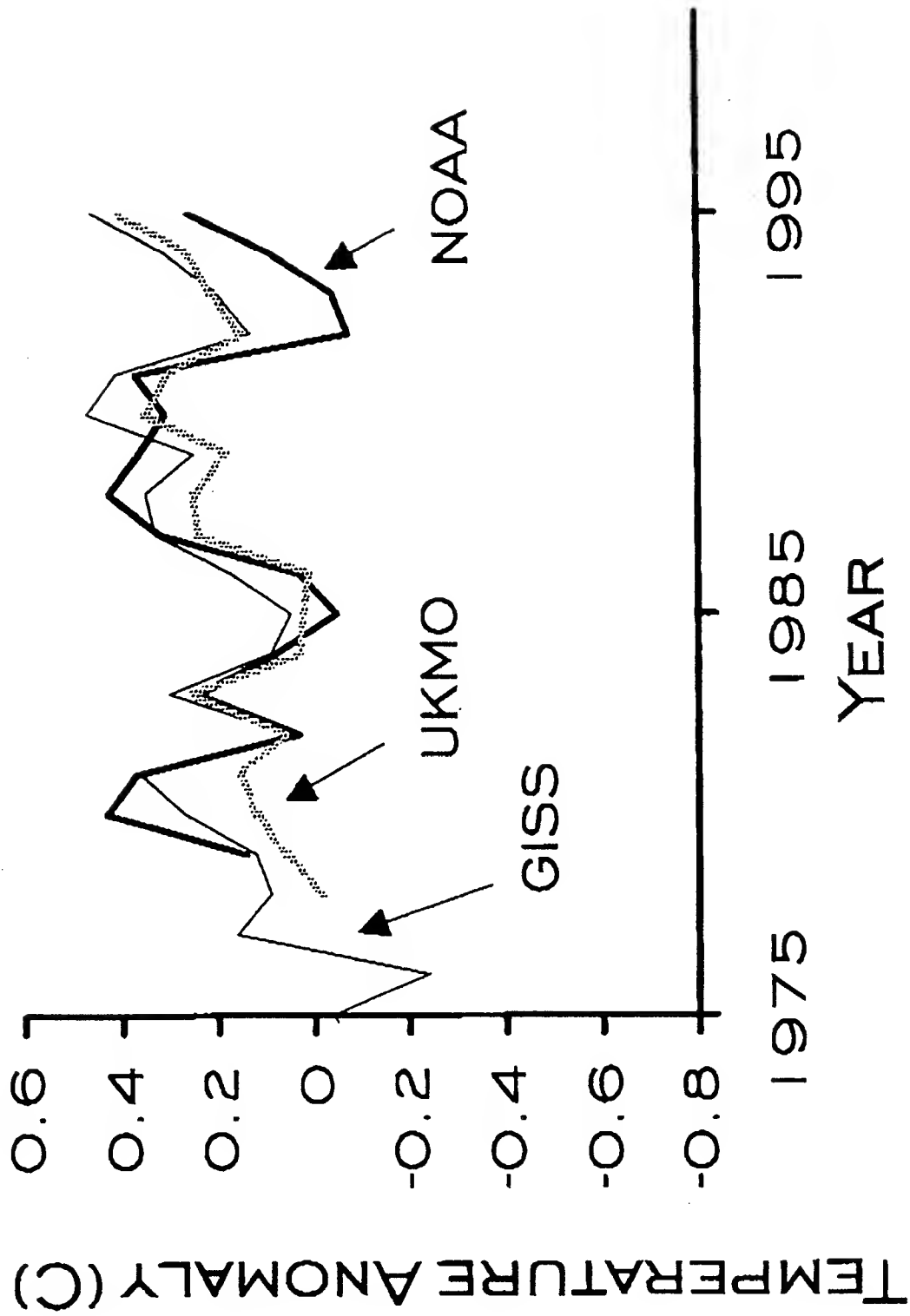


FIGURE 7







# INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



IPCC WORKING GROUP I

SIXTH SESSION

Mexico City, 10 September 1996

WGI/6th/INF. 2, Rev. 1  
(11-IX-1996)

STATEMENT REGARDING THE FIFTH SESSION OF  
IPCC WORKING GROUP I (MADRID, 27 - 29 NOVEMBER, 1995)  
BY THE CO-CHAIRMEN OF THE WORKING GROUP  
PRESENTED TO, BUT NOT APPROVED BY,  
THE WORKING GROUP.

**Summary of Meeting**

The Plenary meeting was opened by the Working Group I Co-Chairman Sir John Houghton at 10.00 hours on 27 November 1995 in the Palacio de Congresos y Exposiciones, Plaza de Lima. The opening session was addressed by Spanish Secretary of State for the Environment and Housing, Mrs. Christina Narbona.

A list of attendees at the meeting is at Annex 1.

The Agenda (Annex 2) was approved by the meeting.

#### **The Summary for Policymakers and the Technical Summary**

Because of shortage of time it was not possible to approve all the original material in the Summary for Policymakers. The draft Executive Summary presented to the meeting was extended and became the Summary for Policymakers. The rest of the material in the draft Summary for Policymakers circulated to governments and organisations prior to the Session was renamed the Technical Summary.

#### **Approval of the Summary for Policymakers**

After extensive discussion, the Summary for Policymakers was approved unanimously by the Session with the concurrence of the Lead Authors present as a correct and balanced statement of the state of the science.

#### **Acceptance of the Technical Summary**

During the meeting much of the material in the Technical Summary went through much of the procedure normally used in the approval process. However, because it was not possible to prepare and distribute to the Session a completely revised version of the Technical Summary, the Technical Summary was transmitted to the IPCC at its Eleventh Session, (Rome 11 - 15, December 1995) for acceptance.

[Note: The IPCC, acting on behalf of Working Group I, accepted the Technical Summary as presented at the Eleventh Session subject to the authors of the Technical Summary taking into account review comments received before the end of the Eleventh Session.]

#### **Acceptance of the Background Chapters**

Review comments on the background chapters continued to be received after the Chapters were circulated on 9 October and during the Madrid Working Group I Session. Further, the

Madrid Session included many hours of discussion and debate regarding the draft Chapter on detection of climate change (chapter 8) in the context of the best and most scientifically accurate wording for the Summary for Policymakers.

During this debate, the Chairman of the meeting (Sir John Houghton) and the Chairman of the IPCC (Professor Bolin) stated that, in accordance with the IPCC rules of procedure which demand clarity, consistency and balance in both the Chapters and the Summary for Policymakers, it was proper and important for the governments present to make proposals to the Lead Authors for changes in the Chapters as well as proposals to the Session regarding the wording of the SPM. The major agenda item for the Session was to discuss and to clarify the material in the draft Chapters as well as to agree the SPM.

Proposals for alterations in draft Chapter 8 were made to the meeting both by scientists and by delegates. According to the IPCC procedures, it was stated that it was the responsibility of the Lead Authors to consider such proposals for revision of the draft Chapters in the light of their responsibility to ensure scientific accuracy and consistency and to ensure as required by the procedures, that the Chapters represented a comprehensive, objective and balanced view of the science.

The Working Group accepted the draft chapters subject to their revision by the Lead Authors taking into account the guidance provided at the Session, in particular the need for overall consistency.

#### Closure of the Meeting

The US delegate made the following statement and requested its inclusion in the report of the meeting:

"While fully supporting the Working Group I Summary for Policy Makers as adopted, the United States regrets that time pressures at the Madrid meeting prevented much of the material now contained in the Technical Summary from being approved for inclusion in the Summary for Policy Makers itself. The United States also regrets that the same time constraints precluded representatives from non-governmental organisations from participating fully in the meeting."

After expressing thanks to the Spanish Government, the interpreters and to all those involved in the organisation of the Session the Co-Chairman, Sir John Houghton, closed the meeting at 12.20am on 30 November, 1995.

TO: ERIC REINER  
ENVIRONMENTAL  
Technology and  
Services



To: John Shlaes  
From: Bronson Gardner  
Re: Summary of Mexico City IPCC Meetings

The following summarizes the highlights of the IPCC meetings in Mexico City.

### **I. Working Group I (Sept 10)**

The chairman of working group I, Sir John Houghton, drafted a report of the WGI Plenary in Madrid in which he defended the changes made to chapter 8 of the SAR. The report was released as an "information" document, thus precluding the opportunity to discuss the paper in plenary. After strenuous objection, it was decided that Sir John's statement should be retitled as a "Chairman's Statement", with the disclaimer that the statement was presented to, but not approved by WGI.

The revised IPCC Guidelines for National Greenhouse Gas Inventories were accepted by WGI (and the entire IPCC Plenary) and forwarded to the Subsidiary Body for Scientific and Technical Advice (SBSTA).

### **II. New IPCC Chairman**

Bob Watson was elected the new chairman of the IPCC. Bert Bolin officially steps down after the 1997 IPCC Plenary (Sept., 1997). In the interim, Bob Watson will serve as a "chairman in training". Bert Bolin will address the IPCC at COP-3, however.

As the result of his election to chairman of the IPCC, the IPCC will now need to elect a new chairman of working group II. This issue was not discussed.

### **III. Rules of Procedure**

A proposal to make "minor editorial" changes to the rules of procedure was not discussed. It was decided, after brief debate, that the current rules are become too complex and need to be consolidated. The IPCC Secretariat will prepare a consolidated version of the rules and distribute them for comment and review before the next IPCC plenary.

### **IV. Technical Papers and Special Reports**

There was intense and lengthy debate regarding the rules of procedure regarding technical papers. The IPCC rules state that technical papers are to be "based on" the second assessment report. Several, including John Houghton, argued that all the technical papers met this criteria. After debating the issue, the GCC helped develop language which clearly interprets the meaning of the phrase "based on". Although this negotiation was difficult, requiring assistance from several countries, the language proposed by the GCC was accepted almost in its entirety. (see Append I).

After the approval of this language, the following was decided regarding the first three technical papers circulated by the IPCC:

"Policies and Measures". It was decided that this paper meets the requirements for a Technical Paper.

"Modelling of Stabilization Scenarios". It was decided that parts of this paper do not meet the requirements for a technical paper. Consequently, the paper will be rewritten to conform to the

rules.  
"Environmental Implications of Emissions Limitations". It was decided that this paper, in its current form, does not meet the requirements for a technical paper. Bert Bolin and Sir John Houghton will develop a new set of scenarios and present them to SBSTA and formally ask SBSTA whether the scenarios they propose are "appropriate". If SBSTA formally requests the IPCC to run the recommended scenarios, then a new paper with this same title will be written and circulated for review. The paper will still be put forward as a technical paper. The justification given is that the revised paper will use the same model and assumptions as used in the SAR, so that the new scenarios amount to a "sensitivity study" of the model.

It is noteworthy that the U.S. delegated strongly insisted that this paper could only be brought forward as a Special Report (which requires plenary approval). They voiced strong objection to presenting the material in this paper as a Technical Paper.

#### IPCC Work Plan

The IPCC work plan for 1997/98 was debated and approved. Several important special reports, technical papers, workshops and "scoping papers" are planned. (see Appendix II). Among these work which will be conducted will be a scoping paper addressing the interpretation of "dangerous" as it is used in the Framework Convention on Climate Change.

## Appendix I

### Requirement for IPCC Technical Papers

Language Approved by the IPCC Plenary in Mexico City, Sept 11-13, 1996

"The following guidelines have been developed to interpret the requirement that information in Technical Papers should be 'based on the material already in the IPCC assessment reports and special reports'

**The scientific and technical information in the Technical Papers must be derived from:**

- (a) IPCC reports and relevant portions of references cited and relied upon therein;
- (b) relevant models with their assumptions, and scenarios based on socio-economic assumptions, as they were used to provide information in those IPCC reports, as well as emission profiles for sensitivity studies, if the basis for their construction and use is fully explained in the Technical paper.

The Technical papers should be referenced so far as is possible to the sub-section of the relevant IPCC reports and related material.

## Appendix II

### **Announced IPCC Activities 1996- 1997**

## Meetings

1. IPCC Workshop on regional climate change projections for impact assessments	Sept 24-26, London	
2. IPCC Working Group II and Main Plenary	Sept 1997	
3. IPCC Bureau	Nov 7-8, 1996	
4. IPCC Bureau	1997	
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## **Technical Papers**

1. Policies and Measures	Nov 1996	SBSTA
2. Modeling of stabilization scenarios	Nov 1996	SBSTA
3. Environmental implications of emission limitations	1997	SBSTA
4. Simple climate models	Nov 1996	SBSTA
5. Regional impacts of climate change	Feb 1997	SBSTA
6. Methodological and technological aspects of technology transfer	Feb 1997	SBSTA

## Workshops

1. Regional Climate Change Projections for impact assessment	3rd Q. 1997	SBSTA/ TAR
2. Adaptation	1997	SBSTA
3. Economic Impacts of Annex I Actions on developing Countries	Late 2Q. 1997	SBSTA
4. Integrated Assessment Modeling	March 1997	SBSTA
5. Integrated Assessment Capacity Building	1997-2000	START
6. Mitigation and Adaptation cost assessment guidelines.	April 1997	TAR
7. Integrated Assessment Modeling (workshop II)	1998	SBSTA/TAR
8. Workshop on Rapid non-linear change	Mar-Apr 1998	SBSTA/TAR
9. Role of oceans and coral reefs in the carbon cycle	?	TAR

## Scoping Papers

1. Technology Assessment (expert group meeting)	Sept 1997	TAR
2. Scientific information relevant to the interpretation of dangerous levels of GHG concentrations in the atmosphere on the climate system	Sept 1997	TAR
3. Risk management techniques for decision-making under uncertainty.	1997	TAR
4. IAEA full fuel-cycle emissions	late 1997	other



# Memorandum

**DATE:** October 16, 1996  
**TO:** GCC-STAC CORRESPONDENTS  
**FROM:** Chuck Hakkarinen  
**SUBJECT:** IPCC London Workshop

Here is the summary report on the IPCC Workshop on Regional Climate Change Projections, which I attended in London September 24-26, 1996. There were 140 registered attendees, including IPCC chair Bert Bolin and chair-elect Bob Watson, and the leaders of all three IPCC technical support units. Scientists attending the meeting came from most disciplines found in the IPCC's three working groups, plus there was a good sampling of representatives from developing countries.

The summary report that was available at the official close of the meeting (attached, with some annotations added during the last afternoon reading of the report) is not complete. An ad hoc group including the TSU chairs was scheduled to meet Friday morning, September 27 to fill in the gaps, particularly the "summary of agreed actions". (I was not able to attend this meeting due to a prior engagement in Paris.) The revised report will be sent later to all meeting participants.

It was evident in the meeting that the "preferred path" of developing complete new emissions scenarios through an Energy Modeling Forum - 14 project, and full scale GCM runs with regional specificity and ecological impacts studies following those, will not be completed in time for full inclusion in the IPCC Third Assessment Report (TAR). While the formal schedule for such a report has not yet been adopted; indeed, will not be adopted for at least another year, the general betting was that it would be requested for full completion by the year 2000, or early 2001.

The "preferred path" would like take until at least 2003, so much of the meeting was spent debating (and some planning) for various "fast-track" approaches that could produce a report with substantive new results on an earlier schedule. This would likely require some "provisional emissions profiles" from the IPCC WGIII participants, and less than full-scale GCM runs (possibly using downscaling approaches or simple climate models) from IPCC WGI and less than complete analyses from IPCC WGII.

Even the nomenclature and responsibilities for the Working Groups is uncertain, because Bob Watson announced on the last day of the workshop that he wants to

reorganize the IPCC process during his tenure (which starts in late 1997). He stated that he will be developing a White Paper over the next six weeks containing his thoughts for reorganization, and will distribute it for comments to the IPCC Council members and "selected academics". One particular comment I noted is that he wants "greater involvement by business and industry representatives at the front end" in planning and participation in the IPCC report preparation, not just in reviewing drafts of reports near the end of the process. In coffee-time side conversations, I was asked my opinion by some as to why "industry" had not volunteered more people to participate in preparing the SAR. Such a request had been made, for example, in 1993 by the IPCC specifically to the Global Climate Coalition, requesting nominations from industry for people to serve on chapter writing teams, but had not resulted in very many industry representative nominations to serve on IPCC chapter writing teams. Dr. Watson implied in his comments that he would like to see industry participation expanded in the preparation of the next assessment report.

# IPCC Workshop on Regional Climate Change Projections for Impact Assessment

**24 -26 September, 1996, Imperial College, London.**

## **Expanded Timetable for Day 1: 24 September 1996**

<b>Time</b>	<b>Presentation</b>
9.30 - 9.50	Welcome and Introduction: Aims of workshop/stage setting for Third Assessment Report <i>Bert Bolin and John Houghton</i>
9.50 - 10.05	(1) The needs of the impacts community for climate information, including output from Coupled GCMs. To be covered by the following 3 presentations: <ul style="list-style-type: none"> <li>Interfacing Ecological Impact Assessments of Global Change with climate information from Observations and Simulations <i>Wolfgang Cramer</i></li> </ul>
10.05 - 10.20	<ul style="list-style-type: none"> <li>Needs for Climate Information <i>Steve Hostetler and Pat Bartlein</i></li> </ul>
10.20 - 10.35	<ul style="list-style-type: none"> <li>Needs in Assessing Impacts and Evaluating Adaptations in Agriculture and Food Security <i>Martin Parry</i></li> </ul>
10.35 - 10.50	<ul style="list-style-type: none"> <li>Presentation 3 (Hydrology/water resources) <i>Nigel Arnell</i></li> </ul>
10.50 - 11.10	Questions on all Section (1) presentations
11.10 - 11.40	TEA/COFFEE
11.40 - 12.00	(2) Technical Data Transfer and Capacity Building Issues in Developing Countries <i>Murari Lal</i>
12.00 - 12.10	Questions
12.10 - 12.30	(3) What the climate modelling and observed climate communities can provide to the impacts community, including post-processing. To be covered by the following 3 presentations. <ul style="list-style-type: none"> <li>The generation of impacts-relevant statistics from coupled climate models. <i>Ulrich Cubasch</i></li> </ul>
12.30 - 12.50	<ul style="list-style-type: none"> <li>Transforming the results of climate models to the scales of impacts. <i>Linda Meams</i></li> </ul>
12.50 - 13.10	<ul style="list-style-type: none"> <li>Establishing observed baseline climatologies and datasets: issues and problems. <i>Phil Jones</i></li> </ul>
13.10 - 13.30	Questions

**13.30 - 15.00 LUNCH**

**15.00 - 15.20 (4) What Climate Modellers need in terms of Emission Scenarios.**  
*John Mitchell*

**15.20 - 15.30 Questions**

**15.30 - 15.50 (5) New Reference Scenarios**  
*Neborjsa Nakicenovic*

**15.50 - 16.00 Questions**

**16.00 - 16.30 TEA/COFFEE**

**16.30 - 16.50 (6) Emission Scenarios for the Third IPCC Assessment**  
*Joseph Alcamo*

**16.50 - 17.00 Questions**

**17.00 - 18.30 Agreement in plenary on workshop programme/organisation followed by initial break-out group discussions if time permits.**

**18.30 - 19.30 Reception**

# Report of IPCC Workshop on Regional Climate Change Projections for Impact Assessment

24 - 26 September 1996, Imperial College, London

## 1. Introduction

Following introductions by Sir John Houghton, Co-chairman of IPCC Working Group I and Prof Bert Bolin, IPCC Chairman, outlining the aims and objectives for the workshop, a series of presentations were made giving overviews of the main subject areas to be discussed. A timetable of the presentations is at Annex A and abstracts of the presentations at Annex B. A list of participants to the workshop is at Annex C.

The meeting then formed three breakout groups to cover the following areas, with all of the groups being additionally tasked with giving particular consideration to the needs of developing countries:

A) Impact Assessment - what climate and emission scenario data are required?

B) Climate information including coupled GCM output - what can be provided? What are the needs of the climate modelling community for emission scenarios?

C) Emission scenarios - what data can be provided?

Sections 2 to 5 summarise briefly the issues discussed and the conclusions reached.

In reaching those conclusions the workshop was continuously aware of the critical factor of the timing of the IPCC Third Assessment Report (TAR) and of other activities in the IPCC work programme, in particular the Special Report being produced on revised emission scenarios. As this Special Report is likely to take 2 - 2 1/2 years in preparation the scenarios produced will become available to the modelling and impacts communities in late 1998 - mid 1999.

Recognising that it would take at least one further year before the major coupled ocean/atmosphere GCM centres would be able to utilise these scenarios and make the results available the workshop concluded that this would not be possible in time for these results to be used in the TAR if the latter is to be completed by the end of 2000, because of the lengthy drafting and review processes involved. However, it may be possible for simple climate models to be run on the necessary time scale and for the new emission scenarios to be used directly by the impacts community.

## 2. Impact assessment - what climate and emission scenario data are required?

The general conclusions of the impacts group were that:

- the impacts community should play a more "pro-active" role in defining the goals, inputs, procedures and outputs of Working Group II, instead of a "re-active" role in simply providing sets of impacts to pre-defined climate change scenarios. This would enable a better balance between the climate modelling and impacts communities in developing a more integrated, consistent assessment for the TAR.
- the driving question is not solely *What are the impacts of climate changes?* but includes *What are the rates and magnitudes of climate changes to which the impact sectors are most sensitive?*

observed) required for impacts research are wide ranging and diverse. In order to meet these requirements for future assessments it is important to assess a number of factors:

(S. Shaville: most impacts are not  
non-linearly related)

What is available now.

There are also equilibrium climate change runs which are available now, as well as AMIP simulations that can be used.

**Climate Change Experiments:**

- o State of the art: Historically forced multi-century ensembles of climate change experiments (with and/or without sulphates)
- o High resolution (T106) time-slice experiments.
- o Various Regional Climate Model experiments
- o These experiments are forced using IS92 or similar emissions scenarios

**Results/Data available now to the impacts community:**

- o The full range of climate variables required by the impacts community are available from the results of GCM climate change experiments at the model's spatial resolution.
- o Global coverage
- o Multi-century daily and monthly time series, monthly means and annual means.
- o High quality observed mean climatologies and Reanalysis data sets are available to accompany the GCM datasets.

**Mechanisms for the Dissemination of Data:**

- o Most modelling centres undertake consultation exercises with the impacts community
- o Each modelling centre has its own approach - these vary from anonymous ftp to organised interface servicing case-by-case requests
- o Provision of entry-level scenarios: e.g. Greco et al. SCENGEN

Application of Climate Datasets for Impacts Assessment

**Current**

- o Most impacts studies to date have used mean monthly values for a small ~~set~~ range of climate variables.
- o The majority of studies have been sensitivity based or use climate change scenarios derived from equilibrium climate change experiments and are, therefore, not time-dependent.
- o The few ~~coping edge~~ published studies in impacts research are using multi-decadal time-series (monthly and daily) or use impacts model linked to GCM climate change experiments

Future:

A goal for impacts assessments is the use of consistent climate change datasets over space/sector and for these to related to the full range of uncertainty about future climate change.

To achieve this: *(recommendation to set up an expert group)*

- o There is a need to adopt a clear strategy for the correct dissemination of climate change scenarios i.e. backed up by relevant scientific and technical advice.
- There is a need for a consistent set of entry-level climate change scenarios
- o Expert contacts to modelling/data centres
- o There is a need for information regarding the performance of GCMs at a regional level
- o Inventory of applicable GCM/RCM climate change experiments datasets

One such solution may be the adoption of a "two-tier" mechanism for the provision of climate change datasets. Such a mechanism is flexible to meet the dynamic nature of climate change experiments and the requirements of the impacts community.

### Two-Tier Approach

- o Construct a set of entry-level climate change scenarios (for example monthly changes based around the SCENGEN Framework) to meet the requirements of a large proportion of the impacts community
- o Provide easy-access to more detailed state-of-the-art results from GCM/RCM climate change experiments (e.g. daily transient data) for those in the impacts community who require them (i.e. higher-level scenarios).
- o Allow access to observational datasets
- o Backup the provision of these results (both entry-level and higher-level) with a support service which can provide: scientific and technical advice on the characteristics of these datasets; establish a network of users so that dynamic cross-fertilisation of ideas can be transferred; and provide information on the construction methods that can be employed for the "downscaling" of these datasets (Review of such science could form a new chapter in the TAR).

### 3.2. What GCM runs over next 1 year/2 years/3 years?

- Climate modeling groups have produced a range of scenarios (using different forcings, with and without different levels of aerosol loading, which provide a range of potential future climates. It was suggested that impacts modelers should work with these results.
- The most advance coupled ocean/atmosphere GCMs are extremely expensive in computer time and will mainly be employed over the next few years to improve the scientific understanding of climate change, to test the parameterizations, the effect of higher resolution and to narrow uncertainties in climate projections. The workshop emphasised the importance of these developments.

- 1 over next 2 years runs with +1% pa equivalent CO<sub>2</sub> (with 'no' or IS92a aerosols) using
- 2 existing models will be carried out -will be employed for intercomparisons.
- 3
- 4 intercomparisons and validation being addressed by CLIVAR (WCRP) programme.
- 5
- 6 by 3 years time, new models will have been run -could input into WG1 assessment in <sup>2000</sup>2001,
- 7 but not into impacts assessment by <sup>2000</sup>2001.
- 8
- 9
- 10 Aerosol forcing will remain very uncertain. Question of sensitivity to aerosol could possibly
- 11 be addressed (will GCM groups run it?) but would need crude but realistic aerosol emission
- 12 profiles and patterns. Could these be generated by this meeting?
- 13
- 14 Regarding how to address climate impacts of land-use change:
- 15
  - 16 a) need to understand differences in outputs using relatively more simple forcing
  - 17 schemes, before land-use change is included;
  - 18
  - 19 b) land use not so important for global climate, but for regional projections -- however
  - 20 do not expect quick advances on this issue; to detect a model response, one needs fairly
  - 21 wide-spread land-use change (continental scale)
  - 22
  - 23 c) modelers are not sure how to represent changes in land-use in the models, even at a
  - 24 regional/local scale. Land-use change involves injection of sooty-aerosols into the
  - 25 atmosphere, changes in albedo.

26 State of science is much too early to represent the processes reliably in either

27 global or regional basis. Appropriate studies need to be carried out to advance this

28 issue. IGAC looking at this issue and should be encouraged. CLIVAR also

29 interested from point of view of sensitivity studies.

30 (NB: land-use representation also needs to be improved for carbon cycle modeling)

- 31
- 32
- 33 • Transient CO<sub>2</sub> with improved SO<sub>2</sub> (new runs) Aerosol effect

34 Important forcings occur due to sulphate aerosol, other aerosol (e.g. biomass

35 burning), and tropospheric ozone which show a lot of regional variation as compared

36 with the long lived greenhouse gases. The current and future concentrations and the

37 regional distribution possess a lot of uncertainty as does the detail of the forcing

38 patterns both in magnitude and distribution (especially for instance the indirect effect

39 of aerosol). Improvement needs to be made in the knowledge of these forcings and

40 their climate impact.

41

42 Sulphate aerosol was particularly emphasised in the 1995 report but information was

43 only available for 'no' aerosol and the IS92 scenario. For the TAR it will be

44 important for information to be available showing the sensitivity of climate change

45 to a wide range of aerosol amounts and distribution.

46

47 There are already transient AOGCM available with IS92a and IS92d SO<sub>2</sub> emissions

48 and equilibrium runs with different regional aerosols distributions and forcings.

49 Other GCM and equilibrium model runs will become available during the next 1 - 2

50 years and can be used for impact studies.

51

52 It is important to understand the uncertainties related to total aerosol forcing

53 (including biomass aerosols), the regional distribution of emissions, etc. There are

54 also uncertainties in how to represent aerosols in the models - different modeling

55 groups handle this in different ways. While there is ongoing work, there is little

56 likelihood of substantial reductions in uncertainty.

57

58

Some found this paragraph  
rather negative.



*regarding*

• Transient CO<sub>2</sub> *with* mitigation -- "stabilization scenarios" (new runs)

There is demand for obtaining as much information as possible regarding the climate and impacts implications of different emissions trajectories and atmospheric stabilization levels. In particular, what are the implications of rapid increases and decreases in emissions? It was suggested that such stabilization runs as a unifying device for the synthesis report. One could run the 450 and 650 profiles and address what would happen in 2050, 2100, and at equilibrium with respect to a variety of issues including a) climate implications of each of these; b) damages from each of these; c) technology implications -- is there technology available to achieve each of these?

There are some transient AOGCM runs currently available which increment at 1% p.a. up to 2xCO<sub>2</sub> and then held constant there. With these other GCM runs the particular scientific issues to be addressed concerning the relation between GCM and energy balance model runs (is there divergence when the rate of CO<sub>2</sub> concentration increase changes sharply?), and how these patterns of climate change are likely to be altered by different time-dependent profiles. Simple models (e.g. at lower resolution) could be employed to study some of these points.

Careful consideration needs to be given to what coupled GCM runs are needed and how they can be carried out most efficiently (e.g. use of time slices).

A next step is to compare the results of some of the AOGCM and simple model runs, to see whether scaling AOGCM results with energy balance models has validity. There is also need to work out what a stabilization emissions profile would look like.

The critical issue for deciding whether new runs are needed is whether the choice of emissions pathway has implications for the pattern of climate change? (John Mitchell stated two scientific issues which need to be assessed). Debate about whether we can answer these issues with the runs currently available.

*(which are the role of the ocean and climate war with simple E.B. models)*  
It was suggested that an expert group might meet over a six-month period to assess these issues.

Other general points:

On the interface between climate and impacts modeling: Need to develop two products: 1) a guide for use of scenarios and 2) a chapter in the TAR on scenario development and downscaling.

The report of the meeting should include a time line.

3.3. Regional climate information through limited area models, downscaling etc.

a) General Points

- much activity by wide variety of groups.
- value not just in better resolution but in studying extreme events etc.
- very much in research mode -and will continue so -eg very dependent on driving GCM.
- some coordinated intercomparison work going on in limited regions.

1 b) Set of suggested criteria for selecting regions:

2 Should IPCC (this meeting?) attempt to choose limited number of regions (say 3?) for  
3 intercomparison purposes? First step should be to agree a set of criteria for selecting regions.

4 2 purposes:

- 5  
6  
7 (1) Improve/encourage testing of techniques available - e.g., validation/intercomparison,  
8 comparison of statistical downscaling and regional modelling  
9 (2) Provision of data for impact case studies

10 Suggested criteria

11  
12  
13 1. Process issues - regions where processes not well represented at GCM grid scales are  
14 important

15 topographic gradients  
16 land-surface heterogeneity (coastlines, lakes, sharp ecosystem boundaries)  
17 large-scale dynamics is not the dominant source of precipitation (scale mismatch)  
18 importance of feedbacks

19 2. Impact factors

20 threats to biodiversity  
21 rapid changes in land use and/or land cover  
22 flood/drought prone regions  
23 vulnerable agriculture/food security  
24 infrastructure is not easily adaptable  
25 heterogeneous disease receptivity  
26 severe storms/surges

27 3. Political factors

28 region already stressed by other factors  
29 sensitivity/vulnerability  
30 high degree of inequity (e.g., AOSIS regions)

31 4. Resource constraints

32 Data availability/quality  
33 Access to hardware  
34 Available financing  
35 Institutional capability

36 5. Pragmatic considerations:

37 Areas where research has already started (GEWEX, LBA, MacKenzie Basin, BALTEX, etc.)

38 9. Representativity

39 10. Distinguish between regions where downscaling techniques well established/not well  
40 established

41 Other issues

42 Possibly try and add weight to different criteria.

## Strategy:

Consider regions that have already been studied, how well do they fit the criteria? Are there gaps that need to be filled?

### c) Should IPCC specify details of intercomparison (EG time slices)?

Define the type of information needed for Third Assessment Report and suggest a minimum set of criteria for downscaling studies that would help to provide that information. Care needed to avoid being too prescriptive.

*Studies should specify:*

*How to stimulate intercomparison!*

region  
variables  
resolution (space and time)  
methods *< data demands*  
time series  
when data will become available

Include an appendix which lists (a) current regional modelling/downscaling activity and (b) what is planned for next 1-2 years (?)

[Note: useful data: re-analysis data at T106 resolution - help impacts community evaluate impact models]

### TAR issues raised in discussion:

Add chapter which assess downscaling and other climate scenario generation techniques (WGI or WGII reports).

WGII report - include case studies (i.e., cross sector studies) as well as sectoral breakdown

### 3.4. Connection with international research programmes

- importance of IPCC fostering connections between IPCC and international research programmes (eg WCRP, IGBP etc).

*bringing this point in the front page*

### 4. Emission scenarios - what data can be provided?

Working Group 3 of IPCC was charged by the 1996 IPCC Plenary session with the preparation of a Special Report on emissions scenarios. As a part of the current workshop, relevant experts undertook an initial consideration of how this Special Report might be developed, and how the emissions scenarios contained therein might be incorporated in the preparation of the IPCC Third Assessment Report (under the working assumption that this report would likely be issued in late 2000 or sometime during the year 2001).

The group also considered what information, if any, it could usefully provide as input to the development of sensitivity analyses using computationally-intensive GCMs whose inherently long solution times mean that there will be limited opportunity to run sensitivity cases using these models based on the new emissions scenarios that will be developed in the Special Report. Both of these topics are considered below.

#### 4.1 New emissions scenarios and their role in the TAR

There was agreement among participating experts from both developing and developed countries that the emissions scenario process should focus on the Special Report scenarios rather than an attempt to make selected fixes to the 1992 IPCC scenarios. The development of new scenarios for the Special Report would proceed in an open process, starting with a broad review of the literature on key driving forces. Experts from developing countries would be encouraged to play a key role in the process and on the writing teams, as would experts from non governmental interests with relevant expertise, including experts from industry. The process is designed so that regional and national information, whether derived from modeling analyses or through other means, can feed into the development of global scenarios. A detailed outline of the proposed approach will be made available by Working Group 3 in the near future.

#### The process of developing new emissions scenarios

As noted above, the process for creating the new emissions scenarios will be open and inclusive. Key steps in the process are expected to be:

- preparation of a series of background papers on input assumptions and relationships, such as population, economic growth and technology.
- distribution of the background papers to interested groups. Any interested group would be encouraged to submit emissions scenarios using their own assumptions. Their scenarios may cover any geographic region or time period.
- New emissions scenarios will be high when possible to the new emission inventories.
- the scenarios will be discussed in a workshop. Participants will then have an opportunity to revise their scenarios.
- all scenarios will be archived so that they are available to interested users. The writing team will assemble 3 to 5 scenarios that are representative of the range of scenarios produced.

The Special Report will cover the background papers and document the representative scenarios. It will be subject to peer and government review.

As part of the Third Assessment Report Working Group III will also assess scenarios to achieve stable atmospheric concentrations of greenhouse gases. These scenarios will be not be generated by the writing team. *PLC (as part of this process) i.e. before the TAR*

The Special Report is expected to be approved in 1999. Given that schedule, it will not be possible to use them in computationally-intensive GCM runs prior to the Third Assessment Report. Rather, the climate implications must be estimated using simple climate models.

#### The role of the new emissions scenarios in the 3rd assessment report

Given the purpose of this workshop, the breakout group focused on how these new Special Report (SR) scenarios will be used in the Third Assessment Report (TAR). The time required to complete the Special Report, taken in conjunction with the computational requirements for computationally-intensive GCMs and the anticipated timing of the TAR mean that it is unlikely that the scenarios developed in the Special Report process could be used to drive new runs of complex GCMs to be included in the TAR. However, the Special Report scenarios are nonetheless anticipated to play a central role in the TAR, particularly with respect to the following three main purposes: as input to climate modeling within working group 1, as the basis for assessing mitigation costs and economic impacts in working group 3, and for impact analysis by working group 2.

- the SR scenarios will could be used to drive simple climate models (calibrated to the complex GCMs?) of the type that were used for purposes of developing insights into global-scale temperature and sea-level changes due to anthropogenic emissions of greenhouse gases and aerosols in the SAR. Runs of these simple climate models driven by SR scenarios would be used for similar purposes in the TAR.

put this paragraph in page 10, line 13

- the SR scenarios, which will incorporate updated socio-economic data and more current projections of future socio-economic scenarios, and improved technology information, information could be used as the starting point for analyses of mitigation measures and their costs in the TAR.
- the SR scenarios could drive some of the impacts analyses in the TAR. This would be done by continuing the current practice in impacts assessment of using the relationship between simple climate models and results from complex GCMs in a downscaling procedure to generate detailed scenarios for impacts analysis that are consistent with simple climate model results based on the SR scenarios, but incorporate key insights and detail developed from runs of complex GCMs using existing scenarios.

The attached figure, presented in the workshop plenary, summarizes the anticipated role of the SR scenarios within the TAR.

#### 4.2 Sensitivity Analyses Using existing GCMs

WG1 experts suggested that the computational requirements for GCMs were such that only a small number of new runs could be completed in time to contribute to the TAR. In light of this limitation, these experts suggested that an, new sensitivity analysis should complement the set of existing GCM results, which should also be used in the TAR process. Two areas identified for potential new sensitivity analysis using GCMs were sulfate aerosols and stabilization of atmospheric concentrations.

##### a) Sulfate Aerosols

*(the case of ozone has been highlighted by some participants, it was answered that there were many uncertainties in the knowledge of the emissions of precursors of the pollutant ozone)*

The request for input from energy and scenarios experts, specified to be given within the timeframe of the workshop itself, sparked a spirited discussion among the latter group. Given the intended use of such sensitivity analysis, the group saw many advantages of suggesting a sensitivity case that could be linked to the carbon and sulfate emissions profiles within existing scenarios. The following two ideas were briefly discussed:

- Apply the carbon/sulfur ratio from IS92d to a scenario in which carbon emissions followed the path of IS92a. This sensitivity would reduce energy-related sulfur emissions in 2050 and 2100 by about 1/4 from levels incorporated in the IS92a scenario while maintaining a carbon/sulfur ratio within the range spanned by the IS92 scenario set. It would also provide some basis for regional allocation of sulfate emissions based on information in the IS92 scenarios.
- Maintain global sulfur emissions constant at the 1990 level through 2100. This would be an arbitrary selection for purposes of sensitivity analysis that would give a decline of approximately 1/2 from levels incorporated in the IS92a scenario for 2050 and 2100. This approach might be viewed as reflecting some linear combination of the procedure outlined above with an alternative that uses IS92a carbon emissions and IS92d sulfate emissions. One disadvantage is that there would be no basis in the existing IPCC literature for the regional allocation of these emissions.
- The group also noted that it was important to consider sensitivity cases involving consideration of biomass aerosols, including their spatial distribution and temporal trends.

The group was unable to reach consensus on which approach was appropriate. There was however, a clear consensus that any analysis of this type, using these or other approaches, should be clearly labeled as being a sensitivity analysis rather than another scenario.)

##### b) Atmospheric stabilization sensitivities.

There was also considerable interest in atmospheric stabilization sensitivities for carbon dioxide concentrations using GCMs. Three interesting issues were immediately identified by the group:

- what stabilization levels should be run?
- what paths to stabilization should be considered?
- how should emissions of different gases be linked in the stabilization scenarios?

*this point will be addressed by the task force*

Ideally, it would be appropriate to consider the full range of stabilization scenarios, both sets of stabilization pathways to each stabilization level (the latter themselves already drawn from a much larger set of emissions pathways consistent with stabilization) presented in the IPCC Second Assessment Report, and a range of alternative sulfur aerosol futures. Given the computational requirements for complex GCMs, it is clear that such an approach is not practicable. In light of practicability considerations, considerable consensus was achieved around the following proposal:

- First, consider only two stabilization levels for carbon dioxide concentrations. There was general agreement that one level to be looked at was stabilization at 450ppm. Two alternatives for the second level were 650 ppm and 750 ppm. Stabilization of other gases is also to be considered as a part of these stabilization sensitivities, but the level at which concentrations of gases other than carbon dioxide were to be stabilized was not discussed. There was consensus across the group that these analyses should be clearly labeled as sensitivities and it should be explicitly noted in any reports that the choice of stabilization levels for sensitivity analysis did not constitute policy recommendations as to what concentration levels might be consistent with the objectives of the FCCC.
- Second, consider two alternative emission pathways to stabilization for the high concentration case. Consideration of alternative emissions pathways in at least one case is necessary to shed light on the differences in transient climate associated with different emissions pathways to the same stabilization level.
- Third, stabilization sensitivities should pay careful attention to linkages between sulfur and carbon emissions paths that are both tied to fossil fuel use. One approach that gained broad support would be to fix the time trend of the sulfur/carbon ratio at the level implicit in a scenario such as IS92a, since it is likely that GCM runs that have already been completed for such a scenario would be contrasted to the stabilization GCM sensitivities.

## 5. Needs of developing countries

*activity for instance*

Greater participation of developing countries in the IPCC process is necessary and can be facilitated by the following actions:

- Implement training workshops in developing countries, 2-3 weeks
- improving the network of developing country researchers participating in the IPCC. Rely on regional networks (START and its regional partners, including IAL, APN, EIRICH) and specialized communities (natural hazards reduction) to supplement author lists and organize financial support early on
  - securing funding for developing country researcher participation in both scenario development and application. Possibility of securing funding through the GEF will be increased if requests are related to country reporting requirements under the UNFCCC.
  - providing free and open access to all materials in a form appropriate to the technology available in developing countries, e.g. PCs, analytical tools such as crop models, forestry models, etc. ---
  - using existing facilities (ACMAD)

## 6. Summary of agreed actions

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- 3 • **Data transfer to the impacts community**
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- 8 • **Regional modelling (choice of regions and other criteria)**
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- 13 • **Emission scenarios**
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- 18 • **Closer links with other research programmes**
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- 23 • **Developing countries**
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# NEW EMISSIONS SCENARIOS IN THE TAR

